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Index to Session Abstracts
Saturday, May 4, 1996

Please see Author Index on page 45 to locate first authors of abstracts.

POSTER SESSION
10:00 - 11:00 AM
SATURDAY, MAY 4, 1996
OSBORNE HALL

BOARD A BIOLOGICAL AND PHYSICOCHEMICAL COMPARISONS OF AFFLUENTS AND EFFLUENTS OF AN OHIO RESERVOIR. KIMBERLY R. YANDORA, DEPARTMENT OF BIOLOGY, P.O. BOX 720, WITTENBERG UNIVERSITY, SPRINGFIELD OH 45501-0720

The purpose of this study was to analyze the effect of an impoundment on a stream ecosystem in Clark County, Ohio. Clarence J. Brown Reservoir is a man-made eutrophic reservoir on Buck Creek, a fifth order meandering stream with typical riffle-pool sequences. Samples were collected five times at two different sites upstream and downstream from the reservoir between September and December 1995. Physicochemical and biological properties in similar riffle zones were compared at upstream and downstream sites. The effluent of the dam is characterized by slightly decreased specific conductance, dissolved oxygen concentration, nitrate-nitrogen, and sulfate-sulfur, and increased temperature and pH values. Comparisons of macroinvertebrate communities illustrate similar populations of Hydropsychidae (Tricoptera) between the affluent and effluent of the reservoir. However, differences were found with Athericidae (Diptera) and Elmidae (Coleoptera) populations in upstream sites while populations of Hirudinea, Pelecypoda, and Decapoda were recorded at downstream sites. Physical and chemical properties of the reservoir affluent and effluent create different habitats that may affect macroinvertebrate communities of this lotic ecosystem.

BOARD B POPULATION ESTIMATE OF AN UNDESCRIBED SPECIES OF CRANGONYX FROM DILLION CAVE, INDIANA (CRUSTACEA: AMPHIPODA). MEGAN L. PORTER AND H.H. HOBBS III, DEPARTMENT OF BIOLOGY, WITTENBERG UNIVERSITY, P.O. BOX 720, SPRINGFIELD OH 45501-0720.

As part of an ecological assessment of Hoosier National Forest caves Dillion Cave, Orange County, Indiana has been monitored with respect to physicochemical parameters and cave fauna. Physicochemical parameters monitored between 14 April 1992 and 19 November 1995 such as air temperature (10.0-12.1°C), water temperature (8.0-11.5°C), relative humidity (88-100%), and pH (7.00-8.42) demonstrated relative stability. Aquatic fauna occurring in Dillion Cave include Turbellaria, Nematomorpha, Cambarincolidae, *Cambarus* (E) *laevis* Faxon, *Orconectes* (O.) *i. inermis* Cope, *Caecidotea stygia* Packard, and an undescribed *Crangonyx* species. As a continuation of the assessment. a study of the *Crangonyx* sp. population was conducted. Although many aquatic cave populations are so small that only a few individuals ever are observed, *Crangonyx* sp. found in the Dillion Cave stream are very abundant. To estimate population size a mark-recapture study was conducted on 7 October, 8 October, 29 October, and 19 November 1995. Amphipods were collected, marked, and then returned to the stream at four pool sites within the cave. Using the Shumacher-Eschmeyer index, the mean population size preliminary was estimated to be 777+/-108 individuals/m2. Biological and physicochemical assessment, including *Crangonyx* sp. population estimates, will continue through March 1996.

BOARD C CELLULOSE DIGESTION BY COLEOPTERANS. STEPHANIE A. MILLER AND SIBYL R. BUCHELI, BIOLOGY DEPARTMENT, HIRAM COLLEGE, HIRAM OH 44234.

Cellulose digestion among Coleopterans occurs through mycophagy of hyphal filaments. Digestion is accomplished by the presence of the cellulase complex, which includes endoglucanases (Cx-cellulases), excoglucanases (C1-cellulases), and beta-glucosidases (cellobiases). Cellulose digestion cannot occur without the entire complex. Several beetles are able to synthesize their own Cx-cellulases and cellobiases, but they are unable to synthesize C1-cellulases. These beetles ingest cellulolytic fungal hyphae, which produce C1-cellulase, and retain this enzyme within their midguts. In this study, Coleopterans were collected from rotting wood at the James H. Barrow Field Station, Hiram College, Hiram, Ohio. The beetles were sampled from four plots in the successional forest area and four plots in the mature forest area. Beetles were homogenized live, and the cellulase in the extract was isolated by column chromatography. The product of cellulose digestion (glucose) was treated with 3,5 dinitrosalysilic acid, which gave a colored product that could be measured spectrophotometrically at 540nm. Of the fifteen coleopteran species collected and assayed, only *Megalodance heros* and the *Phanerota fasciata* showed significant cellulase activity. Both species were found in mature and successional areas of the forest. Supported by the Howard Hughes Medical Institute.

BOARD D HOME RANGE ANALYSIS OF CAPTIVE REARED SPOTTED TURTLES (*CLEMMYS GUTTATA*). HORTON H. HOBBS IV AND TIMOTHY L LEWIS, DEPARTMENT OF BIOLOGY, WITTENBERG UNIVERSITY, P.O. BOX 720, SPRINGFIELD OH 45501.

This study was designed to measure differences in the home range of a population of captive spotted turtles (*Clemmys gutatta*) and to determine if turtle activities are based on sex or dominance within a particular environment. Seven spotted turtles were acquired from Pasco County, Florida. The turtles were studied in a 320 liter (2.2m x 0.3m) tank and observations were made randomly twice a day every three to five days per week for fifteen weeks. Room temperatures fluctuated from 20.56° and 23.30°C. The location and sex of each turtle were digitized and we calculated two types of home ranges, the minimum perimeter polygon (MPP), and the Dixon and Chapman harmonic mean (DC). Home ranges did not differ by sex of the turtle ($P > 0.05$). The turtles did partition available space according to dominance. These data are consistent with concurrent field study on spotted turtle home ranges and imply resource partitioning in the wild may be due to dominance hierarchies. This is significant since the environment for the captive turtles is extremely different from that of turtles inhabiting a cold, hard-water fen. Mechanisms that establish home ranges for both populations may be similar in spite of environmental differences.

BOARD E AN ASSESSMENT OF THREE CANDIDATE SPECIES AND TWO ADDITIONAL TROGLOBITIC INVERTEBRATES FROM SOUTHERN OHIO. H. H. HOBBS III, DEPARTMENT OF BIOLOGY, WITTENBERG UNIVERSITY, P.O. BOX 720, SPRINGFIELD OH 45501-0720.

An assessment of five stygian environments, and particularly of the populations of three troglobitic Candidate Species and two additional obligate cavernicoles was initiated and funded in 1994-95 by the Division of Natural Areas and Preserves, Ohio Department of Natural Resources. Five caves from three counties in southwestern Ohio were sampled for biological and physichehemical features. Each of these sites serves as the type locality for a troglobite, all but one species known from a single cave. Results indicate that two of the three candidates (the aquatic isopod, *Caecidotea filicispeluncae* from Fern Cave, Adams County and the carabid beetle, *Pseudanophthalmus ohioensis* from Freeland's Cave, Adams County) are maintaining small but viable populations and are not in immediate threat of extirpation. The third species, aquatic isopod *Caecidotea rotunda* from Frost Cave (Pike County) is very rare yet known from four additional localities. Two other caves were studied and the pseudoscorpion, *Apochthonous hobbsi*, from Buckskin Cave I (Ross County) is maintaining a sizable population whereas the beetle *Pseudanophthalmus krameri* from Cave Hill Cave (Adams County) occurs in very low densities. These troglobites are extremely vulnerable to perturbations and environmental assessments of the surface recharge areas, of the caves, and of these sensitive populations will continue throughout 1996.

BOARD F PHYSICOCHEMICAL COMPARISONS OF TWO LOTIC SYSTEMS IN CLARK AND HOCKING COUNTIES, OHIO. JENNIFER L. MCBEATH AND ERIC D. AKIN, DEPARTMENT OF BIOLOGY, WITTENBERG UNIVERSITY, P.O. BOX 720, SPRINGFIELD OH 45501.

The purpose of this study was to examine the effects of geology and land usage on the physicochemical properties and to determine longitudinal physicochemical trends in two low order Ohio stream systems. Water samples were conducted from 25 September through 9 December 1995 on Rock Run (Clark County) and Pine Cry (Hocking County). Three samples were taken from three locations on Rock Run and from four locations on Pine Creek. Comparative analysis showed pH for Pine Creek to be 6.97+/- 0.06 and 8.02+/-0.04 for Rock Run, $CaCO_3$ for Pine Creek 41+/- 1mg/l and for Rock Run 291+/- 3mg/l, and specific conductance for Pine Creek 188+/- 7µmhos/cm and for Rock Run 640+/- 20µmhos/cm. Trends were observed from upstream to downstream for pH (increase from 6.75+/-0.464 to 7.12+/-0.160 on Pine Creek and decrease from 8.06+/-0.122 to 7.913+/-0.239 on Rock Run), $CaCO_3$ (remained fairly constant in both streams), specific conductance (decrease from 233.20+/-17.7 to 168.2+/-6.67µmhos/cm on Pine Creek and decrease from 657.83+/-20.2 to 619.75+/-19.3 µmhos/cm on Rock Run). Inorganic nutrient concentrations were similar within both streams.

BOARD G NEW MAP OF OHIO ECOREGIONS DELINEATES 19 AREAS LARGER THAN 1000 SQ.KM. C. SCOTT BROCKMAN, OHIO GEOLOGICAL SURVEY, 4383 FOUNTAIN SQUARE DR., COLUMBUS OH 43224.

Ohio has been divided into 19 ecological subregions, which differ from each other in their physical and biological characteristics such as geology, physiography, soils, hydrology, climate, modern flora and fauna, potential natural vegetation, and land use. No single characteristic proved consistently

more important than others in determining ecoregion boundaries; rather, the pattern or gestalt of parameters differed for each. Many of the ecoregions had been considered formally or informally before, such as the Maumee Lake Plain, Darby Plain, and Outer Bluegrass. Some new ecoregions are the Akron-Canton Kames and Mad River Interlobate Plain and, for the first time, unglaciated southeastern Ohio has been divided into several ecoregions. Some ecoregion boundaries are precise, such as between the Ohio-Indiana Till Plain and the Little Miami Early Drift Plain; others are "fuzzy," such as the 20 mile-wide transition zone between the Ann Arbor-Bluffton-Lima Till Plain and the Allegheny Plateau. These mid-level ecological subregions are divisions of larger regions, all part of a national, hierarchial ecoregions mapping program, and will be subdivided further at a later date. Ecoregion mapping is intended to facilitate ecological management decisions. Mapping was funded by the US Forest Service, additional consultation was provided by the Ohio Department of Natural Resources, USEPA, Ohio EPA, and Natural Resource Conservation Service.

BOARD I EFFECT OF BACTERIAL PREY DENSITY ON GRAZING RATE BY *TETRAHYMENA PYRIFORMIS*. NICOLE S. HAMMOND, HELEN L. HAPP, AND ROBERT T. HEATH, DEPT. BIOL. SCI. AND WATER RESOURCES RES. INST., KENT STATE UNIVERSITY, KENT OH 44242-0001.

The purpose of this study was to determine the effects of variation in bacterial densities on the grazing rate of a model ciliate, *Tetrahymena pyriformis*. *T.p.* was grown axenically in protease peptone broth. Ciliates, of a constant cell density of $1x10^4$ cells mL^{-1} were fed laboratory grown *Escherichia coli* strain B tagged with fluoresce in (FLB). FLB were dispensed in concentrations ranging from 10^4 to 10^8 cells mL^{-1}. Ingestion rates were determined directly by epifluorescence microscopy in grazing bouts that lasted for 5 - 80 min. The grazing rate of the ciliates increased with greater prey densities. This suggests that these ciliates grazed more efficiently when greater concentrations of bacterial prey were present. This project was funded, in part, by the Ohio Sea Grant College Program.

BOARD J THE EFFECTS OF NITROGEN AND NITROGEN/PHOSPHORUS NUTRIENT ADDITIONS ON THE SOIL CHEMISTRY OF A 1ST-YEAR OLD-FIELD. JOSEPH W. SANDERS AND MARY BENNINGER-TRUAX, BIOLOGY DEPARTMENT, HIRAM COLLEGE, HIRAM OH 44234.

This research is part of a 5-year examination of the effects of the timing and type of nutrient application on an old-field ecosystem. Thirty 16 x 20 m plots were established on a recently-tilled former corn field during May, 1995. On 20 May 1995 six plots were fertilized with ammonium nitrate at a loading rate of 300 kg/ha nitrogen. Another six plots were fertilized with diammonium phosphate at a loading rate of 300 kg/ha nitrogen and 768 kg/ha phosphorus. Six plots were designated controls. Three 20-cm-deep soil cores were collected from randomly-selected locations in each plot three times during the growing season. Deeper samples (up to 40 cm) were collected when the soil was moist, and the sampler could be inserted further into the ground. Analysis of variance tests of data collected on the first sample date (July 1995) showed a significantly greater amount of nitrogen in ammonium nitrate (N)-treated plots than the control or diammonium phosphate (N/P) plots; the amount of soil phosphorus was significantly higher in the N/P plots than in the N or control plots, magnesium was significantly higher in N and N/P plots than in the control plots. This first sample indicates that the levels of soil nutrients were elevated as a result of fertilizer applications. Later soil samples and other studies conducted in these plots will allow us to examine the fate of the various nutrients in the old-field system, and the effects of these nutrients on the course of succession. Support for this research was provided by the Howard Hughes Medical Institute.

BOARD K EFFECTS OF CERCOSPORIN INFILTRATION IN EITHER DARK OR LIGHT ON ELECTROLYTE LEAKAGE FROM DETACHED LEAVES OF NORMAL AND TEXAS MALE STERILE CYTOPLASM MAIZE. M. O. GARRAWAY AND J. D. BELTRAN, DEPT. OF PLANT PATHOLOGY, THE OHIO STATE UNIVERSITY, COLUMBUS OH 43210.

Detached leaves of Normal (N) and Texas male sterile (Tms) cytoplasm isolines (cv. B37) of maize were infiltrated with 0.1 or 0.5 µg/ml of cercosporin, a toxin associated with the gray leaf spot disease, either in the light or dark for 24 hr at 28 C. They were cut into 4 cm segments then immersed in 25 ml DW and incubated for another 48 or 72 hr in the dark at 28 C. Electrolyte leakage (µmhos/mg dry wt./24 hr) from cercosporin-treated or control segments were compared. Segments from Tms leaves that were infiltrated with cercosporin solutions while in the dark leaked up to 6X more electrolytes than those from leaves not infiltrated with cercosporin. In contrast, segments from Tms leaves that were infiltrated while in the light leaked only 3X more electrolytes, indicating that light reduced the susceptibility of Tms leaves to cercosporin. Also, electrolyte leakage did not increase significantly when leaves from N cytoplasm isolines, or from Tms cytoplasm isolines that contained nuclear genes for the restoration of male fertility, were infiltrated with cercosporin while in either the light or dark. When Tms and N segments each were immersed in a DW bathing solution that contained cercosporin and 10µg/ml of ACC or methionine, chemicals involved in ethylene biosynthesis, more electrolytes leaked from the Tms isoline. Therefore, the increases in electrolyte leakage from Tms cytoplasm maize leaves observed after cercopsorin infiltration in the dark could involve either changes in their production of ethylene and its precursors, or changes in their sensitivity to ethylene.

BOARD L CO_2 ASSIMILATION INTO CELERY LEAVES IS MODULATED BY LIGHT, LEAF AGE, AND SALT STRESS EFFECTS ON KEY ASSIMILATORY ENZYMES. PRUDENCE J. HALL, CLAUDIO CANTINI, JOHN D. EVERARD, AND WAYNE H. LOESCHER, DEPARTMENT OF BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234.

Sucrose and the sugar alcohol mannitol are the primary products of photosynthesis in celery (*Apium graveolens* L.). Under salt stress an increased proportion of assimilated carbon appears in mannitol. Sucrose-phosphate synthase (SPS) and mannose-6-phosphate reductase (M6PR) are key enzymes that regulate carbon partitioning in celery. To determine if differences in carbon partitioning (and in carbohydrate pool sizes) are related to activities of SPS and M6PR, modulation of SPS and M6PR activities by light, developmental age, and salt stress were measured. Results demonstrate that SPS is light activated while M6PR is not, and that activity of both enzymes is modulated by leaf age and salt stress. Supported in part by a Howard Hughes Medical Institute grant to Hiram College and USDA-NRI Grant 940-1439 to WH. Loescher, Horticulture Department, Michigan State University.

BOARD M EFFECTS OF BURNING AND MOWING ON A SAND BARREN FLORA. TIMOTHY L. WALTERS AND ELLIOT J. TRAINER, DEPT. OF BIOLOGY, UNIVERSITY OF TOLEDO, TOLEDO OH 43606.

Dry sand barrens have historically been kept open by periodic fires that limit the woody vegetation and promote fire-tolerant species. This study was designed to quantify the effects of burning and mowing on this rare Ohio plant community. Fall mowing and spring and fall burning treatments were performed on 3x3 meter plots (N=32) in a dry sand barren in the Oak Openings region of southwestern Lucas County, Ohio. In comparison to the untreated plots, fire and mowing reduced the number of florocane branches in *Rubus flagellaris* and spring burning reduced florocane number more than the mowing treatment. The abundance of *Vicia villosa* also decreased with fire. Fall burn decreased the number of flowers and racemes per plant in comparison to the untreated plots. *Hedeoma hispida* decreased with spring burn in comparison to the untreated and mowed plots. Plant and flower abundance of *Aristida purpurescens* was not affected by the treatments. The results show the effects of these treatments on the herbaceous flora during the initial year of management.

BOARD N PRE-TREATMENT FLORAL EVALUATION OF MANCY TRACT, KITTY TODD PRESERVE. TIMOTHY L. WALTERS, DEPT. OF BIOLOGY, UNIVERSITY OF TOLEDO, TOLEDO OH 43606.

The Mancy Tract of The Nature Conservancy's (TNC) Kitty Todd Preserve is located in the Oak Openings region, Lucas County, Ohio. The 52 acre tract was inventoried for plant species richness during the 1995 growing season. Two examples of each of the three community types; wet prairie, shrub/scrub, and swamp forest, were selected. Each of these examples was monitored using nested quadrates along three 60 meter transects. The relative frequency of each plant species was determined for each set of transects. Also, each community type and the tract as a whole were evaluated using a floristic quality index. Over 300 species were found including 21 that are currently listed as potentially threatened, threatened or endangered in Ohio. TNC plans to manage this tract by both fire and mowing. One example of each community type will be used to quantify the effects of these management practices.

BOARD O PLANT ANATOMY AND CRITICAL THINKING SKILLS - A SEASONAL STUDY OF TWO ANGIOSPERMS. JOHN L. FROLA AND DAVID J. STROUP, DEPARTMENT OF BIOLOGY, THE UNIVERSITY OF AKRON, AKRON OH 44325-3908

A seasonal study of two plant species is under investigation. Observations of the shoot apices are described based on an analysis of the theories on shoot apical organization. Measurements and descriptions of apical dome height and width of the species were obtained to serve as a basis for classroom discussions concerning the changes in apical organization over a one-year period. Results from these two studies were used to prepare a multi-media presentation which allowed students to make observations and generate hypotheses about shoot development. During classroom discussion, fundamental anatomical and morphological questions were generated to be used as the basis for student laboratory projects. This research was designed to

improve identified thinking skills, and our current understanding of shoot apical development.

POSTER SESSION
2:00 - 3:00 PM
SATURDAY, MAY 4, 1996
OSBORNE HALL

BOARD A MODIFIED RELAY INTERCROPPING: A SUCCESSFUL SUSTAINABLE AGRICULTURAL APPROACH. STEVEN C. PROCHASKA, OHIO STATE UNIVERSITY EXTENSION, 117 E. MANSFIELD ST., BUCYRUS OH 44820.

To address the issues of farm profitability, farm sustainability and environmental protection, a modified relay intercropping (MRI) system has been studied. In this system, soybeans are planted into wheat at or past the heading stage of growth. Previous Ohio research has demonstrated favorable winter wheat and soybean production when soybeans were interplanted in early May. However, planting soybeans into wheat in early May often conflicts with conventional planting of corn and soybeans. Thus, a modified relay intercropping system has been developed to better utilize farm labor, time and equipment. A descriptive study was conducted. to measure the effects of variable wheat nitrogen fertilizer on soybean yield. Two year soybean yields averaged 33.9 bushels/acre in the MRI system over the variable wheat nitrogen rates. There were significant differences in soybean yield between wheat nitrogen rates in l995 only.

BOARD B A COMPARISON OF GROUND WATER POLLUTION POTENTIAL AND GROUND WATER RESOURCE MAPS: FRANKLIN COUNTY, OHIO. MIKE ANGLE, WATER RESOURCES SECTION, DIVISION OF WATER, OHIO DEPARTMENT OF NATURAL RESOURCES, 1939 FOUNTAIN SQUARE DR., COLUMBUS OH 43224.

Ground Water Resources (GWR) Maps and Ground Water Pollution Potential (GWPP) Maps are the two primary mapping products of the Water Resources Section (WRS). Both maps are produced in color for individual counties at a scale of 1:62,500. GWR Maps are generalized maps showing ground water availability, yields, and aquifer type. GWPP Maps are derived using the DRASTIC system and are more detailed maps which portray the relative vulnerability of aquifers to contamination. DRASTIC is an acronym for Depth to water, Recharge, Aquifer media, Soil type, Topography (slope), Impact of vadose zone media, and hydraulic Conductivity. GWPP Maps have detailed accompanying reports. Comparisons between the maps reveal many trends. Typically, higher-yielding aquifers and shallower aquifers tend to be more vulnerable to contamination. Lower-yielding aquifers and deeper aquifers tend to be less vulnerable to contamination. Major aquifer types depicted on the GWR Maps are represented by hydrogeologic settings on the GWPP Maps.

BOARD C GEOCHEMICAL STUDY OF AN IRON-RICH STEAM, SILVER CREEK METRO-PARK, SUMMIT CO., OHIO. A. BERKOSKI, S. BERTOLO, E. BOLLINGER, S. FINLEY, J. HIRZEL, B. JULIAN, F. KORDINAK, M. KOVACS, R. KOWALKOWSKI, B. LLOYD, M. SAMBLANET, S. SHOEMAKER, C. STOLLER, K. TADAJEWSKI, AND A. FOOS, GEOLOGY DEPARTMENT, UNIVERSITY OF AKRON, AKRON OH 44325-4101. AFOOS@UAKRON.edu.

Silver Creek Metro-park is the site of an abandoned coal mine that has been developed into a park. Over the site of the mine there is now a small reservoir. An iron and sulfate rich spring was diverted from the mine to flow out beyond the dam. The stream containing coal mine runoff, contained a significant amount of rust colored precipitate. Eleven samples were taken from this stream at 50 foot intervals and one at 1600 feet. Three more samples were taken from the reservoir, the dam spillway, and past where the stream and spillway met. Each sample was tested for temperature, pH, dissolved oxygen (DO), total dissolved solids (TDS), alkalinity, Ca, Na, Mg, K, Fe, Si, Cl, Po_4^{3-}, $S0_{4=}$, HCO_3 and trace elements Mn, Zn, Cu, Co, V, Sr, As, Mo, and Ni. Samples from the mine spring were high in Fe, S04 and TDS, and low in DO, relative to the lake and spillway samples. A mixture of the mine stream and spillway was modeled using the discharge and chemical composition of the two streams. These numbers were then compared to the values measured at the conjunction of the streams. Most major and minor ions were accurate to within five percent of the calculated concentrations. A comparison between theoretical and actual data found that HCO_3 was higher while $SO_{4=}$, Fe and Mn were lower than calculated values. This indicates some reaction of the mine spring with the atmosphere. Fe, Si and Mn concentration decreased and DO and HCO_3 increased downstream. The relationship between Fe and downstream distance is markedly linear (R = .995). In general, water from the mine spring precipitates out Fe and while absorbing CO_2 and O_2 from the atmosphere to reach equilibrium.

BOARD D INTERPRETATION OF THE FRESH WATER/BRINE INTERFACE OF THE DEVONIAN/SILURIAN CARBONATES OF CENTRAL OHIO. C. STEVEN COMPTON II, 78 OBERLE AVE., CARROLL OH 43112.

This thesis was conducted to determine the relation between the brine horizon and the beds of the Devonian/Silurian carbonate units known by the drillers' name, Big Lime. The relation can take three forms: A) the brine horizon dips parallel to its parent bed, B) the brine horizon dips at a steeper angle than its parent bed, or C) the brine horizon dips at a shallower angle than its parent bed. It is important to know this relation so that an approximate depth to brine can be determined during the drilling of oil and gas wells, which contain brine as a by-product, in addition to determining the depth at which brine can be found for the injection of waste brine. Data as to the depth to the "First Brine" of the Big Lime and the top of the Big Lime was determined using oil and gas well "header cards" archived in the Geologic Records Section of the Ohio Department of Natural Resources' Division of Geological Survey. The data were imported into SURFER for Windows and contour maps were made of the top of the Big Lime and the elevation of the First Brine Horizon. These maps were compared and the relation between the brine horizon and the top of the Big Lime was determined. This relation agrees with Scenario B above. Utilizing these findings makes it possible to determine the relative placement of the Big Lime's brine horizon compared to its upper surface. This information will aid drillers and environmental scientists in the determination of where brine will be encountered and where brine can be found for the disposal of petroleum-industry brines by injection.

BOARD E USING GIS MODELING TO PREDICT HYDROLOGIC CHANGES FROM STRIP MINING AND SUBSEQUENT RECLAMATION-RESTORATION PROJECT. FRED R. VONER, MARY W. STOERTZ, AND NANCY R. BAIN, DEPARTMENT OF GEOLOGY, MARIETTA COLLEGE, MARIETTA OH 45750.

Digitized topographic maps, field data, and flood frequency models form the layers in a Geographical Information System (GIS) used to examine how changes in forested area and surface water storage capacity impact the peak discharge of surface water runoff in a small watershed. The GIS environment allowed users to model the restoration proposals for the Snow Fork drainage basin in the Athens Unit of the Wayne National Forest of southeastern Ohio. The snow Fork Drainage Basin was extensively strip mined for coal during the period 1930-1960 and is presently being evaluated for restoration by a coalition of local citizens and governmental agencies. Although the area has been reclaimed to help control soil erosion, restoration of water quality has not been achieved with numerous mine seeps each contributing up to one million gallons of acidic water (pH 2-3) to surface runoff daily. Additional problems include complaints by residents of increased seasonal flooding which may be attributed to sedimentation in the lower reaches of the basin and/or an increase in beaver activity. The GIS can be used to predict how changes in surface storage capacity and forested area from mining may have affected peak stream discharge and how restoration may influence peak stream discharge as the project proceeds.

BOARD F APPLICATION AND COMPARISON OF THE UNIVERSAL SOIL LOSS EQUATION (USLE) AND THE REVISED USLE (RUSLE) ON A CONSTRUCTION SITE IN SUMMIT COUNTY, OHIO. KIMBERLY S. DARRAH AND DAN ROSS, DEPARTMENTS OF GEOLOGY AND GEOGRAPHY, KENT STATE UNIVERSITY, KENT OH 44242.

The Universal Soil Loss Equation (USLE) was first published in 1965 as a tool for soil conservationists to assist farmers in determining the amount of soil lost from there land per year. The development of this as tool led to better soil conservation practices on the part of the farmers. In recent years, attention to soil loss has turned away from the farm and toward urban development. In the late 1980's this concern led to thoughts of a Revised Universal Soil Loss Equation (RUSLE). Although the factors remained the same, many improvements were made. More rainfall data was collect to improve isoerodent maps for defining the Rainfall (R) factor. The Erosivity (K) factor accounts not only for the inherent characteristics of the soil but also for seasonal effects. The RUSLE also gives better approximation of topographic effects. The new equation has divided the cover factor into subfactors including prior land use, canopy, ground cover and roughness. Also, values for the conservation practice factor (P) have been determined for areas other than farmland. We have chosen to use a construction site in Stow, Ohio, Summit County, to apply and compare the USLE and the RUSLE. The results of the two equations will be presented in the poster paper.

BOARD G TEKTITES, SPLASH-FORM FROM LAYERED. CLYDE S. BARNHART, 13637 ANGELL ROAD, ATHENS OH 45701-9617.

Two distinct kinds of tektites have long been recognized; splash-form and layered Muong Nong-type. There is an apparent gradual transition from layered to splash-form. Selected layered specimens are shaped and rounded like some splash-forms and some splash-forms have markings attributable to a layered origin. There is no clear boundary between the two forms. If these observations are valid, then it is probable that both forms were originated, shaped and transported by the same process and event.

BOARD H AQUATIC ECOLOGICAL SURVEY FOR THE VALLEYVIEW TRAIL, AKRON, OHIO. **KARNYN L. GIVENS, DIANE CONYERS-RIZZO, MICHAEL D. JOHNSON, LAURA MATARAZA, TODD CRANDALL, JAY ABERCROMBIE AND ELIZABETH BUCHANAN, c/o ACRT, INC. 2545 BAILEY ROAD, P.O. BOX 401, CUYAHOGA FALLS OH 44221.**

The City of Akron has commissioned the construction of a new hike and bike trail that parallels the Cuyahoga River along the old towpath of the Ohio & Erie Canal. The Valleyview Trail will be one of a series of links in the Ohio & Erie Canal National Heritage Corridor which, when completed, will extend 140 km from Zoar to Cleveland. The trail connects with the southern terminus of the Riverview Trail in the Big Bend Area of Sand Run Metro Park. The trail continues southward through the Cuyahoga and Little Cuyahoga River valleys and ends near Perkins Street in Akron. The Cuyahoga River, Little Cuyahoga River, and Ohio & Erie Canal were assessed to determine their chemical and biological water quality and to identify potential ecological impacts of trail construction. Water chemistry results did not exceed state water quality standards, fish Index of Biotic Integrity values fell below water quality standards, and macroinvertebrate communities were dominated by pollution tolerant and moderately tolerant organisms. These data indicate poor to moderate water quality at these sites.

BOARD I DIURNAL FLUCTUATIONS IN THM PRECURSORS IN A SMALL LAKE. **ANGELA B. MARTIN AND DENNIS COOKE, DEPARTMENT OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT OH 44242.**

Trihalomethanes (THMs) form when chlorine reacts with naturally occurring organic matter (THM precursors) in surface waters during the disinfection of drinking water. THMs have carcinogenic and mutagenic properties. As a result, the US EPA has set limits on the amounts of THMs permissible in finished waters. However, many drinking water facilities are finding it difficult to meet these standards. An alternative approach to in-plant changes is to reduce precursor production in raw water. To do this, a better understanding of THM precursor sources and the mechanisms of precursor production are needed. Preliminary studies have shown that diurnal fluctuations in THMFP occur which may correspond to fluctuations in autotrophic and heterotrophic activity. This study investigated the relationship between diurnal fluctuations in THM formation potential (THMFP), chlorophyll, water temperature, turbidity, ORP, transparency and phytoplankton and zooplankton assemblages. THMFP was strongly correlated with chlorophyll concentrations, turbidity, and secchi depth, suggesting that eutrophication of water supplies increases THMFP. Further, these variables may provide surrogate measures of THMFP in some water supplies.

BOARD J PALEOLIMNOLOGICAL INVESTIGATION OF THE OKEFENOKEE SWAMP. **BRENDA S. SIMMERS, JOHAN F. GOTTGENS AND BRIAN E. ROOD, DEPARTMENT OF BIOLOGY, UNIVERSITY OF TOLEDO, TOLEDO OH 43606.**

The Okefenokee Swamp, one of the largest freshwater wetlands in the United States, is located on the border of southwestern Georgia and northern Florida. A paleolimnological study was initiated in 1994 to help reconstruct the history of the system. Two sediment cores, 44cm and 28cm in length, were retrieved using a push corer. Chronology was established using lead-210 and cesium-137 gamma counting, and verified with independent age markers. Recent and historic accumulation rates for bulk sediment, organic carbon. phosphorus and nitrogen will be established to compare pre- and post-settlement and silviculture trends. Mercury accumulation rates over time will be compared with records from other regional systems to provide complementary information on past deposition rates and recent trends in the southeastern United States.

BOARD K IMPACTS OF EROSION ON THE BENTHIC MACROINVERTEBRATE COMMUNITY OF THE EAST BRANCH OF NIMISHILLEN CREEK DURING WINTER. **T.R. PAULUS[1] AND J.R. BEAVER[2], [1]STARK COUNTY HEALTH DEPARTMENT, 3951 CONVENIENCE CIRCLE NW, CANTON OH, 44718, [2]UNIVERSITY OF AKRON, DEPARTMENT OF BIOLOGY, ASC, AKRON OH 44325.**

The benthic macro invertebrate community of a 25km^2, predominantly agricultural sub-basin of the East Branch of Nimishillen Creek was assessed during winter of 1994. The timing of sampling events corresponded to periods of high precipitation and runoff. Although in-stream dissolved oxygen concentrations were strongly correlated with total phosphorus concentrations, dissolved oxygen concentrations remained above 10 mg/l during the sampling period. The macroinvertebrate communities at sites located adjacent to feed lots subject to high erosion rates were less diverse than those located in areas with more riparian cover and less erosion. Our results suggest that the macroinvertebrate community of this stream during winter is most strongly influenced by physical alteration to the substrate by erosion events and is not significantly impacted by dissolved oxygen concentrations despite the high input of organic matter. Recovery of the macroinvertebrate community from substrate perturbations attributable to runoff events was rapid. The relationship between erosion impacts on substrate quality during winter, land use patterns, and macroinvertebrate diversity indices and biotic scores will be discussed.

BOARD L SOURCES OF PERSISTENT AND BIOACCUMULATIVE POLLUTANTS DISCHARGED TO LAKE ERIE FROM OHIO POINT SOURCES. **J.R. BEAVER[1], L. YEOMANS[2], AND B.A. SCHABERG[3], [1]UNIVERSITY OF AKRON, DEPARTMENT OF BIOLOGY, ASC, AKRON OH 44325, [2]CITIZENS POLICY CENTER/OHIO CITIZEN ACTION, 402 TERMINAL TOWER, CLEVELAND OH 44113, [3]BEAVER SCHABERG ASSOCIATES, INC., 3620 INGLESIDE ROAD, SHAKER HEIGHTS OH 44122.**

Since the 1970's the eutrophication of Lake Erie has been reversed as a result of reduction in point source loadings of phosphorous from the watershed, however the lake continues to receive significant point source loadings of toxic pollutants (as identified by the Great Lakes Water Quality Initiative). During 1993 Lake Erie received approximately 324,000 pounds of persistent and bioaccumulative substances from Ohio industrial and wastewater treatment sources. Wastewater treatment facilities were responsible for more than 64 of this amount. More than 49% of the point source discharges to Lake Erie originated in Cuyahoga County. Many of the pollutants discharged to Lake Erie by industrial and wastewater treatment plants are associated with developmental, nervous system, and reproductive abnormalities in humans, wildlife, and aquatic life. A proposed change in water quality standards for Ohio's rivers and streams will allow increased discharges of these persistent and bioaccumulative substances to more than 90% of the state's waters. Implications of these new, less restrictive water quality standards on the health of Lake Erie will be discussed.

BOARD M MORPHOLOGY OF COMMENSAL OSTRACODS (FAMILY ENTOCYTHERIDAE). **NATALIE H. WADDELL, WITTENBERG UNIVERSITY, BOX 2798, P.O. BOX 6100, SPRINGFIELD OH 45501.**

Commensal ostracods (Family Entocytheridae) were gathered from *Orconectes rusticus* collected in and around Clark County, OH. Ostracods were deshelled and cleared prior to mounting on carbon tape for SEM viewing. External morphology was examined in an SEM, focusing on peniforum morphology for species identification.

BOARD N MIDSUMMER PLANKTON COMMUNITIES OF SELECT OHIO WETLANDS. **J K. ACTON, J.R. BEAVER, AND D.W. OTT, UNIVERSITY OF AKRON, DEPARTMENT OF BIOLOGY, ASC, AKRON OH 44325.**

The abundance and composition of the midsummer plankton communities of 24 Ohio wetlands were evaluated and related to potential controlling variables in 1995. Six representative sites from the following wetland types were included: impacted, non-impacted (pristine), constructed, and temporary. Physical and chemical parameters were evaluated contemporaneously with biological variables. The zooplankton communities of all wetlands were dominated by cosmopolitan crustacean and rotifer taxa typical of lake plankton communities. The dominant rotifer, copepod, and cladoceran were, respectively, *Polyarthra vulgaris, Cyclops* sp., and *Ceriodaphnia reticulata.* Overall, copepod nauplii were the dominants in most of the wetlands. Total zooplankton abundance was most strongly related to chlorophyll a concentrations over the range of trophic conditions studied. In general, rotifer abundance increased with an increase in total chlorophyll a concentrations. The relationship between zooplankton abundance and total phosphorus was also significant but was much weaker. The interactions among zooplankton and phytoplankton populations, land-use patterns, and wetland types will be discussed.

BOARD O COMPARISON OF BACTERIAL COMMUNITIES FROM SEPARATE SITES WITHIN AN OHIO LAKE. **CONRAD E. WICKSTROM, DALE A.CASAMATTA AND BETTIE D. OGREN-PALMISON, DEPARTMENT OF BIOLOGICAL SCIENCES AND WATER RESOURCES RESEARCH INSTITUTE, KENT 0H 44242.**

The bacterial community from three different habitats within East Twin Lake (Portage Co.) was sampled during the autumn of 1995. Bacterioplankton from pelagic and littoral water samples were compared with each other and with epiphytic bacteria removed by sonication from collected macrophytes (*Myriophyllum spicatum*). Viable counts (colony-forming units, CFU) and strain isolations were accomplished on Standard Methods Agar streak plates. CFU and DAPI direct microscopic counts were significantly greater in littoral water (1.6E4 CFU/mL and 5.IE6 bacteria/mL, respectively) compared to the pelagic samples (4.OE2, 2.1E6). Epiphyte counts ranged from 1.6E7 CFU/g DW to 1 5E9 bact/g DW. Viable counts were only 0.02% to 0.36% of DAPI counts. Specific identifications are yet to be completed; however, plate transects with enumeration of colony pigmentation types indicate habitat-related community differences. Transparent:white:pigmented percentages for the pelagic community were 21:55:24; the littoral and macrophyte ratios were 28:51:21 and 45:41:14, respectively. Endospore-forming species are most common in the macrophyte community. These findings are part of the initial phase of a study on the proteolytic activities of and interactions between bacterial populations within East Twin Lake. Toward that end, we have 20 diverse clones from the pelagic, 16 from the littoral and 25 from the macrophyte communities. These and additional strains will be used for those studies.

Board P A STUDY OF THE CHEMICAL PARAMETERS OF EIGHT TEMPERATE HARD WATER SPRINGS IN JOHN BRYAN STATE PARK, GREENE COUNTY, OHIO. **Kathryn A. Wolfe, Department of Biology, Wittenberg University, P.O. Box 720, Springfield OH 45501.**

The chemistry of springheads of eight temperate cold-water springs located in Greene County, Ohio are compared. These small springs flow from a dolomite bluff above the south bank of Little Miami River in John Bryan State Park. For convenience, the springs were arbitrarily numbered from one to eight in a West to East direction. Concentrations (mg/l) (ranges in parentheses) of O_2 (7.3-10.0 mg/l), CO_2, $CaCO_3$, NO_3-N, SO_4-S, PO_4-P, and Fe were obtained along with pH (5.90-8.42 mg/l), specific conductance (Sc as mmhos/cm) (319-962 mmhos/cm), and turbidity (NTU). These chemical parameters were observed from September to December. The chemical variations in each spring over time were studied as well as the average differences among the chemistry of all the springs. Results indicate that the springheads maintain thermal and chemical stability; however, NO_3-N, SC, and methyl orange alkalinity values are high. Oxygen, SC, CO_2, $CaCO_3$, and SO_4-S seem to increase as the spring number increases (from West to East), while temperature, pH, turbidity, Fe, PO_4-P, and NO_3-N remain relatively constant and predictable. However, spring #4, which had little flow for the first two sample periods and eventually no flow, does not follow this trend. Spring #4 has comparatively high average temperature, O_2, CO_2, $CaCO_3$, turbidity, and Fe, while its SC and SO_4-S are low; NO_3-N concentration in spring #4 fluctuate from high to low. Spring #2 also stopped flowing after the second collection time; however, it follows the same trends of the other springs during its period of flow.

Board Q UNIONID MUSSELS OF NORTHEAST OHIO'S GRAND RIVER FROM HARPERSFIELD TO PAINESVILLE. **Greg Zimmerman and Martin Huehner, Biology Dept., Hiram College, Hiram OH 44234.**

During July of 1995, 18 stops from river mile 9.2 to 30.8 were searched visually, by hand, with bottom sieves, and dip nets. A total of 4,264 living and 1999 dead mussels comprising 23 species were found. *Actinonaias ligamentina carinata* were most abundant and comprised 64% of living mussels found. Quadrat samples were taken in 6 transects that represented different habitats and produced from 0 to 44 live mussels per square meter, with an avenge of 13.2. Species diversity ranged from 5 to 13 species among the 6 transects. Three of the species found, *Lampsilis fasciola*, *Ligumia recta*, and *Truncilla truncata*, are listed as Ohio Special Interest, while two others, *Epioblasma triquetra* and *Simpsonaias ambigua* are also listed as Federal Category 2. Supported by an ODNR Natural Areas and Preserves Grant and by the Howard Hughes Medical Institute.

Board R COMPARING MULTIPLE COMPARISON PROCEDURES AND THEIR USE IN ENVIRONMENTAL STATISTICS. **Craig W. Steele and Carol Skinner, Dept. of Biology and Health Services, Edinboro University, Edinboro PA 16444.**

Analyses of experimental data in environmental biology, and other sciences, often involve inferences drawn from multiple related comparisons made within the framework of a single experiment. Such analysis necessitate the use of some multiple comparison procedure to adjust the alpha level in a statistical analysis. Questions addressed in this survey include: 1) When and why is it important to use a multiple comparison procedure?; 2) What are the differences among the various types of procedures and when is each appropriate?; 3) How do the different procedures range from "conservative" to "liberal" in the inferences that can be drawn from them?; 4) How is the choice of a multiple comparison procedure related to the choice of an overall alpha level?; and 5) What nonparametric alternatives are available? Parametric multiple-comparison procedures covered include the Tukey, Scheffe, Bonferroni, Dunnett, Williams, Least Significant Difference, Duncan, and Student Newman-Keuls procedures. Nonparametric procedures surveyed include the Steel's Many-One Rank, Shirley, Signed-Rank, K-Sample Rank, Kruskal-Wallis, and Friedman procedures.

Board S COMPARISON AND DIGITAL ANALYSIS OF VOCALIZATION PATTERNS AND REPERTOIRES OF MALE RED-WINGED BLACKBIRDS (*AGELAIUS PHOENICEUS*). **S. Mukina[A], D. Bebell[A], J. Antonelli[B], C. Skinner[B], and G. McLaren[A], [A]Department of Psychology and [B]Department of Biology, Edinboro University of Pennsylvania, Edinboro PA 16444.**

Male red-winged blackbirds (*Agelaius phoeniceus*) were recorded and observed in adjacent wetland territories in northwestern Pennsylvania (Waterford State Gamelands, no. 109) during the spring and summer of 1995. Analog tape-recordings of vocalizations were completed and territorial behaviors were monitored for each subject during three separate 30 min. observation periods conducted on each of three separate days during the breeding season. Females were observed in each subject's territory during recording. Individual territories and perching positions were mapped for each subject. The results indicated variable repertoire sizes between subjects during the observation period. Specifically, repertoire sizes ranged from a minimum of 3 to a maximum of 6 call types between individuals. Additionally, the results indicated a consistent difference in call type frequency across time. The most frequent call occurred 2,637 times while the least frequent call type occurred only 1 time during the 90 min. observation periods. Analog recordings of these vocalizations were digitally converted with Canary (The Cornell Bioacoustics Workstation, Version 1.1, 1993) on a Macintosh computer for additional analysis.

Board T SURVEY OF THE INSECTS INHABITING THE FUNK BOTTOMS WILDLIFE AREA. **R.N. Williams, R.W. Rings, M.S. Ellis, and D.S. Fickle, Department of Entomology. Ohio Agricultural Research and Development Center of The Ohio State University, 1680 Madison Avenue, Wooster OH 44691.**

In 1995, the Funk Bottoms Wildlife Area was the subject of an ongoing series of insect surveys intended to establish benchmark information on diversity for future reference. Traps utilized in the study include general, battery-powered black light traps, flight intercept (window) traps, Nitidulid Inventory Technique (NIT) traps, and underwater light traps. The strongest emphasis during this survey was placed on the moths (Lepidoptera). In the moth group alone, more than 307 species in 19 families were caught in 1995. The moths were broken down into status categories as follows: abundant species =33, locally abundant species =1, common species =259, locally common species =2, uncommon species =11, rare species =1, and special interest species =1. One rare Lepidoptera specimen was collected. The capture of *Enargia decolor* (Walker) is a new record for Wayne county, and this is only the sixth specimen of this species caught in Ohio. The beetles (Coleoptera) were also of great interest. Currently, 123 species in 39 families have been identified. Many specimens, however, are with specialists awaiting determination. Twenty of these species are within the sap beetle family (Nitidulidae) which was also given special attention.

Poster Session
3:00 - 4:00 PM
Saturday, May 4, 1996
Osborne Hall

Board A THE KINETICS OF LIPID CRYSTAL FORMATION AS STUDIED BY SURFACE PRESSURE MEASUREMENTS. **Ali I. Ozgenc, Christopher M. Spillmann*, Anne Flewelling, and Anna Ploplis Andrews, Physics Department, The College of Wooster, Wooster OH 44691.**

When a quantity of lipid is dissolved in chloroform and spread on a water surface of limited area, crystals form as the solvent evaporates and the molecules experience hydrophobic interactions. When formed on an ultrapure water surface, the crystals formed are fractal in shape and differ according to lipid composition. This crystallization takes place in the presence of a mono-

layer of the lipid, so that changes in the surface pressure of the monolayer precisely reflect the kinetics of the crystal formation. A Langmuir balance with strain gauge transducer was used to sense the surface pressure as crystals form for constant temperature and surface area. We have investigated the kinetics of several lipids and report results for the time constants associated with the spreading of the monolayer, the folding and collapse of the monolayer, and rearrangement of crystals. We hope to extend this work to include video measurements of the fractal properties of the crystals. *This investigator was supported by NSF grant DMR-9322301.

BOARD B INHIBITION OF PLATELET AGGREGATION BY BICYCLIC L-BENZYLOCTAHYDROISOQUINOLINES. **MARC HERDMAM, GAMAL SHAMS, KARL ROMSTEDT, SHANKAR SAHA, VICTORIA ROCHE AND DENNIS FELLER, CAPITAL UNIVERSITY, BIOLOGY DEPT., 2199 EAST MAIN ST., COLUMBUS OH 43209.**

Excessive platelet aggregation contributes to thrombotic diseases. Trimetoquinol (TMQ) and related bicyclic 1-benzyloctahydroisoquinolines have been shown to inhibit platelet activation by the stable thromboxane A_2 (TX) analog, U46619. Four, novel bicyclic 1-benzyl-substituted octahydroisoquinoline derivatives, each containing a p-chlorobenzyl unit, were synthesized and evaluated for their ability to inhibit platelets. These analogs include the secondary amine (I) and its N-formyl (II, tertiary) and N,N-dimethyl (III, quaternary) derivatives as well as a tertiary amine containing a pyridine ring (IV). The compounds, including TMQ, inhibited U46619 and ADP-mediated aggregation and ^{3}H-SQ 29,548 radioligand binding to TX receptors in a concentration-dependent fashion. Compounds I-IV were nearly equipotent. It has previously been proposed that the bicyclic octahydroisoquinolines inhibit platelets by a mechanism related to their lipophilicity (Shams et al., 1993). However, since varying degrees of ionization among analogs I-IV resulted in little difference in anti platelet potency, neither a hydrophobic character nor a cationic center may be necessary.

BOARD C EFFECTS OF POLYCHLORINATED BIPHENYLS (PCBS) ON INSULIN AND SERUM GLUCOSE LEVELS IN RATS. **MARY E. BOLIN, BETH B. PRITTS, LEE A. MESERVE, BIOLOGY DEPARTMENT, BOWLING GREEN STATE UNIVERSITY, LIFE SCIENCES BUILDING, BOWLING GREEN OH 43402.**

Polychlorinated biphenyls are environmental pollutants which are known to have various carcinogenic and metabolic effects. The incidence of diabetes with PCB exposure has been noted in literature, however statistically significant experimentation has not been documented (MEDLINE - through 11/95). The present study compares the insulin/serum glucose ratios for female rats exposed to PCBs for time periods between 2.5-5 months and exposure levels of 0 PPM, 125 PPM, and 250 PPM. Initial results indicated that rats exposed to 125 PPM PCB had an insulin/serum glucose ratio of about half that of the control rats. The insulin/serum glucose ratios of the rats exposed to 250 PPM PCB were also below those of control animals. Experimentation is presently underway to determine whether the amount of food ingested the night before insulin and glucose testing plays a significant role in these ratios and/or whether the differences observed in the ratios were direct results of PCB exposure or appetite induced.

BOARD D FACTORS INVOLVED IN POAG: CAROTENOID INTAKE, EYE COLOR, AND GIRTH MEASUREMENTS. **C.A. GREENWELL AND D.M. SPILLMAN, DEPARTMENT OF PHYSICAL EDUCATION, HEALTH AND SPORTS STUDIES, PHILLIPS HALL, MIAMI UNIVERSITY, OXFORD OH 45056.**

Glaucoma is the leading cause of irreversible blindness throughout the world. While many factors are believed to be associated with this disease there are still a number that have not been thoroughly examined. This study investigates some of those associated conditions including the possible effects of high intake of carotenoids, eye color, and girth measurements, three factors upon which little to no research has been done, on primary open angle glaucoma (POAG). Researchers designed a questionnaire that inquired about diet and family and personal health history. This questionnaire was administered to 250 individuals suffering from glaucoma. The dietary data that was obtained, suggested that a possible correlation could be made between low habitual intake of vitamin A, E, and C and higher risk of intraocular hypertension. In additions the number of persons suffering from POAG with blue eye color was significantly higher than those with brown or green. Finally, a possible association has been suggested as a result of this study, concerning girth measurements. It was proposed that those persons with proportionately larger than normal girth measurements may be more likely to suffer from POAG.

BOARD E GLAUCOMA: FACT AND FICTION. **C.A. GREENWELL AND D.M. SPILLMAN, DEPARTMENT OF PHYSICAL EDUCATION, HEALTH AND SPORTS STUDIES, PHILLIPS HALL MIAMI UNIVERSITY, OXFORD OH 45056.**

Approximately 80,000 Americans have been blinded by one of the most serious visual disorders in the world, primary open-angle glaucoma (POAG). This is a multifactoral disease, meaning that the contributions of many conditions increase a person's susceptibility. The purpose of this research was to examine the proposed factors believed to cause POAG and discuss the ones that have been both proven and disproven. Among those that scientists have found to be positively correlated to the disease are African race and darker skin color; family history, especially that of siblings; untreated systolic hypertension; type two diabetes mellitus. Dietary effects and obesity are suggested factors, but more research must be conducted before a statement is made. Factors that were speculated to be possibly linked to POAG but have since been disproven are also discussed. These are caffeine consumption; alcohol consumption; migraine headaches; and smoking. The researchers support the correlation of the above factors but stress that until there is a definitive etiology of glaucoma, all roots must be reviewed.

BOARD F THE EFFECTS OF ESTROGEN AND TESTOSTERONE ON THE DEVELOPMENT OF HYPERTENSION IN OVARIECTOMIZED FEMALE SPONTANEOUSIVELY HYPERTENSIVE RATS (SHR) ON A HIGH SODIUM DIET. **BEI LIU, GAIL DUNPHY, DANIEL ELY, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3098.**

The existence of differences in the development of hypertension between sexes has been well established. This study examined the effect of testosterone and effect of estrogen on the development of hypertension. The SHRs, at five weeks of age, were placed in four groups: control (n=8), ovariectomized (n=6), testosterone implants (n=6), and ovariectomized = testosterone implants (n=6). All groups were fed a high sodium (3%) diet in order to potentiate a blood pressure rise. Blood samples were collected retroorbitally at 8, 12, and 15 weeks of age and frozen at -70C for NE (HPLC) and testosterone (RIA) analysis. Blood pressure (BP) was measured weekly by tail cuff sphygmomanometry for ten weeks. ANOVA showed that BP was significantly different among treatment groups ($p=0.010$) compared to controls: In this study, we found a significantly increased BP in all testosterone treated animals ($p<0.04$ for Ts, $P<0.001$ for OVX-Ts, respectively) compared to that of controls. Although the BP of OVX-T was higher than that of T, the difference was not significant ($p>0.5$). There was a significantly lower plasma level of NE in all treatment groups ($p=0.0002$) compared to that of controls. These results indicate that: 1) testosterone enhances the development of hypertension; 2) there appears to be a potentiation of NE in the presence of intact ovaries.

BOARD G AN ANALYSIS OF LIVE BIRTH CONGENITAL MALFORMATIONS IN STARK COUNTY OHIO. **JERE M. BOYER***, **RONALD J. BRAUN***, **CHERYL D.G. KLEIN***, **RUPAL M. PATEL***, **EMILY CANIFORD****, **AND WILLIAM FRANKS****, ***NORTHEASTERN OHIO UNIVERSITIES COLLEGE OF MEDICINE, **STARK COUNTY HEALTH DEPARTMENT, *** AULTMAN HOSPITAL, 2600 SIXTH ST. SW, CANTON OH 44710.**

Since 1976 Stark County has ranked near the State of Ohio in the rate (per I,000 live births) of congenital malformations. The 1987 rate for Stark was 9.1 while Ohio was 10.4. However, in 1988, the Stark rate went to 13.5 and the Ohio rate went to 10.9. For the years 1989 to 1993 (latest available records) the Stark rates of congenital malformation were 51.3, 43.2, 36.5, 18.9 and 18.9, respectively. The Ohio rates for 1989 to 1993 were 25 5, 22.7, 20.1, 20.2, 21.4 for the respective years. The intergroup and intragroup variations were statistically significant when pre-1988 data was compared with 1988 to 1992 data (p values <0.01). The 1992 and l993 data was statistically different from the other two groups reported in the intragroup but not the intergroup data (p value <0.05). Further examination of information indicated that a new birth certificate was implemented near the end of 1988 but was not fully utilized until 1989 throughout the state. The old format required the physician of record to write in congenital malformations. The new birth certificate only requires the physician to check off a box, with the exception of "other" which must be checked off and the malformation written onto a line. Confounding the certificate is the fact that "none" precedes "other" on the certificate. Further examination of the certificate data indicated that during the time period 1989 to 1992, of those that had "other " checked, 42.3% had nothing written on the line indicating "malformation." Fully 17.8% had inappropriate responses such as "none" (even though there is a "none" box to check) or (e.g.) discoloration written as the "congenital malformation." An examination of actual birth records of 100 infants who had certificates marked "other" during 1991 and 1992 indicated that only 22 had actual malformations written in the medical record with appropriate documentation. As education and physician awareness increased, the Stark County rate has decreased.

BOARD H KNOWLEDGE OF CARDIOVASCULAR DISEASE IN UNIVERSITY STUDENTS. DIANA M. SPILLMAN PH.D., PHILLIPS HALL, MIAMI UNIVERSITY, OXFORD OH 45056.

Every 32 seconds an American dies from Cardiovascular Disease (CVD). Despite this fact, many individuals do not know the risk factors for CVD. Five hundred students chosen at random completed a questionnaire about CVD knowledge. Less than 16% of the students knew the top three causes of death. Of the CVD risk factors diabetes and race were the least known, while high blood cholesterol, high blood pressure, obesity, inactivity and smoking were the most often known factors. Family history along with high blood pressure, elevated cholesterol and obesity were given as the most common primary risk factors for CVD. On the personal CVD risk factor questions, men did not know their familiar cardiac history, blood pressures or blood cholesterol levels. Women tended to know more about CVD than the men. Overall the students were not knowledgeable about CVD and thought of it as a condition not to be concerned with until later in life.

BOARD I USE OF VITAMIN AND MINERAL SUPPLEMENTS BY THE ELDERLY. CHERYL HAISLER MS, DAVID MITCHELL MS, AND DIANA SPILLMAN PH.D., 18 PHILLIPS HALL, PHS DEPARTMENT, MIAMI UNIVERSITY, OXFORD OH 45056.

This study was to determine the vitamin and mineral use of elderly, free living individuals in the southwestern area of Ohio. A total of 207 elderly (144 women and 63 men) responded to a survey. Only 60 individuals (42 women and 18 men) did not take a supplement. Males and females were equally likely to take supplements. Those individuals taking a vitamin and/or mineral supplement were less likely to have reported major medical problem. They also reported that the supplement had improved their general health. Most individuals purchased their supplements from local groceries and pharmacies. Nearly half were unable (or unwilling) to disclose how much they spent on dietary supplements a month. About half those taking vitamins and minerals said a doctor had recommended that they do so.

BOARD J DIETARY SUPPLEMENTATION AND BODY IMAGE IN FEMALE COLLEGE STUDENTS. KARIN HILDEBRANDT, MICHELLE LAYDING, AND DIANA SPILLMAN, PHILLIPS HALL MIAMI UNIVERSITY, OXFORD OH 45056.

This study was conducted to determine the relationships between body image and the use of dietary supplement use in female college students. A questionnaire was sent to 200 randomly selected female students, with 97 (48%) returned. The surveys included questions on use of supplements, obsession with food behavior, previous diagnosis of an eating disorder, exercise habits and basic nutrition knowledge. Results showed that 21 students used supplementation. There were no correlation's found between eating disorders and supplement use; however, there was a direct correlation found between supplementation, lack of nutrition knowledge and intense physical exercise practices. The students who took supplements also worked out for at least 6 hours week and estimated that their dietary fat intake was 20% or less. Most demonstrated a lack of nutrition knowledge.

BOARD K NAVAL ROTC MIDSHIPMEN'S KNOWLEDGE OF CARDIOVASCULAR DISEASE. JOHN R. BENJAMIN, STUDENT (NAVAL SCIENCE) AND DIANA M. SPILLMAN, PH.D. (PHS), MILLETT HALL, MIAMI UNIVERSITY, OXFORD OH 45056.

Cardiovascular Disease (CVD) is the number one crippler and killer of Americans. The CVD condition starts at a younger age than when CVD is usually detected. The established risk factors are well known in the medical community, but what does the average person know about CVD? Naval Midshipmen were chosen for a questionnaire study because of their perceived health knowledge due to the program's requirement for physical conditioning and adherence to an exercise regimen. The 28 question survey was administered to 38 students (ages 18-24) with seven female and 31 male students. The following was found: (1) No midshipman could identify the three top causes of death in the US, (2) only 20% either knew what HDL/LDL is or could identify LDL as contributing to CVD, (3) 37% did not know both their blood pressure and cholesterol level and 68% did not know their cholesterol level alone, (4) 76% did not identify race as a risk factor for CVD or correctly identify in which populous this condition existed, and (5) less than half (39%) expressed concern about CVD. The midshipmen were not knowledgeable about CVD. From the literature, this appears to he typical for the age group, although surprising due to the emphasis placed on physical conditioning in the NROTC program. Clearly the education programs implemented by such groups as the American Heart Association are not as successful as hoped. A renewed emphasis on a comprehensive education into the causes and prevention of CVD is imperative, especially in this surveyed age group where prevention must have already begun.

BOARD L PHARMACISTS' EVOLVING ROLES IN HEALTH CARE. MARCIA M. WORLEY, R.PH., AND JON C. SCHOMMER, PH.D., THE OHIO STATE UNIVERSITY, COLLEGE OF PHARMACY, 500 WEST 12TH AVENUE, COLUMBUS OH 43210.

The purpose of this study was to investigate the relationships among three independent variables; role overload, role ambiguity, and role conflict, with the dependent variable of pharmacists' counselor role orientation. A random sample of 301 licensed pharmacists actively practicing in Ohio was mailed a questionnaire to obtain their views about the evolving rules of pharmacists in the health care system. Measurement items were purified using Cronbach coefficient alpha and factor analysis. The pharmacists were categorized for analysis as follows: pharmacy manager versus staff pharmacist, community pharmacy versus institutional pharmacy, and low daily average prescription volume (< 150/day) versus high daily average prescription volume (> 150/day). Multiple regression analysis was used to investigate the relationships among the variables according to these categories. Of 273 deliverable surveys, l27 (46.5 percent) were returned in usable form. The results showed that overload, ambiguity, and conflict in pharmacists' roles can affect their orientation towards counseling their patients. Also, the different categories of pharmacists studied were influenced differently by role overload, ambiguity, and conflict. As pharmacists' roles in health care continue to evolve, some "growing pains" will continue to be experienced by various segments of pharmacists.

BOARD M A COMPUTER PROGRAM FOR DOSE-RESPONSE DESCRIPTION OF CHEMICALLY INDUCED OXIDATIVE STRESS. JANUSZ Z. BYCZKOWSKI AND CARLYLE D. FLEMMING, MANTECH ENVIRONMENTAL TECHNOLOGY, INC., P.O. BOX 31009, DAYTON OH 45431-0009.

Risk characterization combines dose-response description with exposure. While the exposure to chemicals, in most cases, can be characterized reliably by direct measurements or can be estimated with physiologically based pharmacodynamic (PBPK) models, the exact dose-response characteristics are much more difficult to define. Particularly problematic are extrapolations of the expected biological effect from high to low doses for so-called "nonspecific" action of prooxidant chemicals affecting several cellular targets simultaneously. To solve this problem, a biologically based pharmacodynamic (BBPD) model was developed, based on a description by Vroegop et al. (Free Rad. Biol. Med. 18:141, 1995). The resultant computer program simulated the dose-dependent biological effects of chemically induced oxidative stress in tissue preparations. The program was written in Advanced Continuous Simulation Language (ACSL) with a FORTRAN sub-routine and simulations were performed using SIMUSOLV software (DOW Chemical Co., Midland MI). The BBPD model described formation of free radicals over time as a function of the prooxidant chemical concentration, and predicted the dose-dependent response of cellular targets at each time. The BBPD model was calibrated with the literature data for free radical generation in liver slices, and for dose-dependent effects of oxidative stress in cultured neuronal N18 hybridoma cells. The BBPD model allowed us to distinguish between the "one-hit" targeted mode of action of free radicals and the "multi-hit" stochastic interaction with multiple nonspecific cellular targets. It is suggested that the algorithm developed and calibrated with experimental data *in vitro* may be employed for future dose-response characterization of action of prooxidant chemicals *in vivo*, using the physiologically based pharmacokinetic/dynamic models. * Supported in part by Dept. of the Air Force Contract No. F33615-90-C-0532 and AFOSR Work Unit No. 2312A202.

BOARD N REGULATION OF AT1 RECEPTOR MRNA IN VASCULAR SMOOTH MUSCLE CELLS FROM SHR AND WKY RATS BY ANGIOTENSIN PEPTIDES. LIOMAR A.A. NEVES*, ROBSON A.S. SANTOS**, AMY MILSTED, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908; **UNIVERSIDADE FEDERAL DE MINAS GERAIS, BELO HORIZONTE, BRAZIL.

We characterized the effect of angiotensin peptides on angiotensin subtype 1 (AT1) receptor gene expression in VSMC from SHR and WKY rats. The effects of Ang-(1-7) and Ang II on AT1 receptor mRNA expression were examined in aortic vascular smooth muscle cells (VSMC) cultured from male SHR and WKY rats. Cells were incubated for 24h in serum-free medium containing Ang-(1-7) (0.01-10 ,µM) or Ang II (0.1-1.0 ,µM). Steady-state mRNA levels were evaluated by Northern blot analysis; the results were expressed as relative levels of AT, mRNA/GAPDH mRNA. In VSMC cultures from either SHR or WKY rats no effect on AT1 mRNA was observed with Ang-(1-7) at doses ranging from 0.01-10µM, however down-regulation of AT1 receptor mRNA was observed in SHR and WKY VSMC treated with Ang II. In VSMC from SHR, Ang II (0.1-l.0 µM) reduced AT1 mRNA levels by 22-46% of control levels, but the reduction was statistically significant only at 1.0µM (46 +/- l3%, $p<0.05$) in WKY rat VSMC the reduction was 24-50% ($p<0.05$) of the control levels. No significant differences were found either between SHR and WKY, or

between doses of Ang II. Our results indicate that the AT1 receptor is not regulated differently by angiotensin peptides in SHR compared to WKY rats. *Supported by CNPq.

BOARD O PCR ANALYSIS OF Y CHROMOSOME SEQUENCES FROM FIXED CYTOGENETIC PREPARATIONS. HOLLY K. WALERIUS[1] AND GAIL D. WENGER[2], DEPTS. OF [1]MOLECULAR GENETICS AND [2]PATHOLOGY, THE OHIO STATE UNIVERSITY, COLUMBUS, OH 43210 AND [2]CYTOGENETICS LABORATORY, CHILDREN'S HOSPITAL, COLUMBUS OH 43205.

With identification of the genes responsible for a variety of human disorders, investigation of an increasing number of diseases at the molecular level becomes possible. Applications of polymerase chain reaction (PCR) using fixed cell preparations are described. This testing allows rapid analysis of sex as well as evaluation of Y chromosome sequences in Turner Syndrome (TS) patients. Individuals with this condition often have short stature, gonadal dysgenesis, and cardiovascular and renal abnormalities; most have a 45,X karyotype. The risk for development of gonadal tumors in these patients is significantly higher in individuals with Y chromosome sequences present. PCR was performed using fixed cell pellets from cultures established for cytogenetic studies. Primers for the Y chromosome genes SRY and DYZ3 were used, as well as for amelogenin, a gene with homologous sequences on the X and Y chromosomes. Amplified product was detected on ethidium bromide-stained agarose gels. Issues of sensitivity and specificity are addressed. Amplification of DYZ3/SRY was found in 3 of 27 TS patients tested, all have a mosaic karyotype 45,X/46,XY. This methodology allows performance of PCR-based testing on standard fixed cytogenetic preparations and sensitive detection of Y chromosome sequences in at-risk TS patients.

BOARD P APPLICATION OF DIGITAL IMAGE ANALYSIS FOR HELPING TO DEFINE THE PROGNOSIS OF SELECTED MALIGNANCIES. DAVID L. MASON, AND MIGUEL A. PEDRAZA, WITTENBERG UNIVERSITY AND COMMUNITY HOSPITAL, SPRINGFIELD OH 45501.

Cells obtained from a variety of malignancies and stained by the Feulgen procedure are evaluated by an integrated digital image analysis system (CAS 200) for determining, on a quantitative basis, two main nuclear features, ploidy and the rate of division, S-phase. As a generalization, malignancies displaying a high aneuploidy cell population and those having a high S-phase have a worse prognosis than those that are diploid and have a low S-phase. Combined features represent an even worse prognosis. A series of histograms display the results on the analysis of a variety of malignancies by CAS. Similar results can be obtained from flow cytometry, and the two typically correlate well; however, with CAS, unlike flow cytometry, individual nuclei can be directly viewed on a monitor, and the operator can selectively evaluate only those nuclei in malignant cells and disregard those in non malignant supportive cells.

BOARD Q AUDITORY PERCEPTIONS OF DIFFERENT TYPES OF MUSIC. DONALD FUCCI, LINDA PETROSINO, CORRY WILCOX, LISA ANDRA, SCHOOL OF HEARING AND SPEECH SCIENCES, LINDLEY HALL 219, OHIO UNIVERSITY, ATHENS OH 45701.

The purpose of the present study was to determine the effect of preference for three different types of music on magnitude estimation scaling behavior in young adults. Three groups of college students, 10 who liked rock music, 10 who liked big band music, and 10 who liked classical music were tested. Subjects were instructed to assign numerical values to a random series of nine suprathreshold intensity levels of 10 second samples of rock music, big band music, and classical music. Data analyses indicated that subjects who liked rock music scaled that stimulus differently than those subjects who liked big band and classical music. Subjects who liked big band music scaled that stimulus differently than those subjects who liked rock music and classical music. All subjects scaled classical music similarly irregardless of their musical preferences. The results were studied in terms of personality types as well as the physical nature of the stimuli. It was suggested that classical music appeals to a wide variety of personality types, unlike rock and big band music. Spectrographic analyses of the three types of music showed that classical music is the most complex of the three stimuli in terms of frequency and amplitude distributions over time. Further research is warranted since music of all types represents an important part of our lives and influences our daily behaviors.

POSTER SESSION
4:00 - 5:00 PM
SATURDAY, MAY 4, 1996
OSBORNE HALL

BOARD A SOLVING THE FOOD SHORTAGE PROBLEM IN NORTHEAST AND NORTHWEST AFRICA USING HYDROPONICALLY GROWN PEANUTS & SOLARLY DISTILLED WATER LINDA S. BOS, 6806 WINDSOR ROAD, HUDSON OH 44236.

In arid coastal climatic regions such as northern Africa, salt water, soil, and sun are plentiful, but it is not currently economically viable to grow crops due to the lack of fresh water. The hypothesis of this project is that the problem can be resolved with the combined uses of growing peanuts hydroponically, solar distillation, and water retention devices The experiments conducted center around growing peanuts hydroponically and creating a working solar distillator. It was determined that peanuts could be grown hydroponically and that they require approximately 0.5 gallons of water per plant per growing season in a closed container. A closed container could be simulated in Africa by planting the peanuts in rows which were dug in the shape of a "U." This "U" would be boarded on all sides including the top by a mylar blanket, minimizing water loss. It was also possible to adapt a practical roof-type solar distillator that could produce 1/10 of a gallon of pure water a day. It can be concluded that an adapted solar distillator can provide the water necessary for peanut plants grown hydroponically in water containment devices. This would be a better way of growing crops in northern Africa.

BOARD B DO ELECTROMAGNETIC FIELDS AFFECT THE WAY PLANTS GROW? LAURA K. WOLESLAGLE, 2388 WHITLOCK PL. ,KETTERING OH 45420.

Numerous studies have suggested that electromagnetic (EM) fields may have harmful effects on humans exposed for long periods of time. My hypothesis is that EM fields may aiso he harmful to plants, and resulting damage occurs quickly due to the rapid growth and short life cycle of the selected study plant. The Raphanus sativus (radish) was chosen for its short germination cycle of twenty one days. Sixteen radish plants were compared in the experiment. Eight were grown in a EM field produced from a small electric fan, and eight were grown outside the EM field as a control group. A Gauss meter was used to measure the EM field and to determine the EM field boundary. The growth in height of both groups were measured and plotted for twenty one days. On termination, the plants were pulled, weighed, and their tap root length measured. This data was also plotted. The EM field plants were: smaller, weighed less, and 75% of the tap roots were longer than those of the control group plants.

BOARD C PARTIAL CHARACTERIZATION AND GENE EXPRESSION OF NHE-2 IN THE MOUSE. SMITA DE, 7955 FAWNCREEK DR. CINCINNATI OH 45249.

It is believed that it is important to maintain the intracellular pH of embryonic cells. The sodium/hydrogen transporter system (NHE), an exchange system found on the cell membrane, helps control intracellular pH. Its function is to relieve an intracellular acid load by exchanging H+ ions with Na+ ions. Different clones of NHE have been previously isolated. In this study, I did a partial characterization of 2 clones thought to have homology to a member of the NHE gene family. The two mouse cDNA isolates were obtained by screening a mouse ilium cDNA library with a rat NHE-1 cDNA probe. The first part of the study was to determine if either of the DNA segments actually coded for a mouse NHE homologue. To do this, several restriction enzyme digests were completed and maps of the different segments of DNA were made. Fragments of the two isolates were then sequenced, and the sequences obtained were compared to the published rat NHE 1 and 2 cDNA sequences. It was determined that one of the isolates most likely codes for mouse NHE-2 due to its similarity. A fragment from this isolate was subcloned and prepared for use to make riboprobes to examine localized areas of gene expression in the developing mouse. Gene expression will be analyzed by whole mount in situ hybridization assays. Results of this study are pending.

BOARD D LINKING GEOLOGY TO THE EFFECTS OF ACID PRECIPITATION ON THE FOOD CHAIN OF *GAVIA IMMERS*. RACHEL A. DUNN, 927 FAIRVIEW AVENUE, BOWLING GREEN OH 43402-1722.

Acid precipitation adversely affects daphnia, a lower link in the *Gavia immers* food chain. Daphnia die more quickly when exposed to water of pH 4.6 and 6.0 than water of pH 7.2. However, maintaining a predetermined pH in the water used for testing proved difficult. This may have been attributable to buffering minerals, which neutralized the sulfuric acid used to adjust pH. From this observation arose a new hypothesis. Buffers in surface water are leached from adjacent soil. With prolonged exposure to lower pH, these buffering agents may be depleted until they are unable to protect a lake from increasing acidity. To test this, a mixture of rain water and acid at a predetermined pH will be run through columns containing soil from the banks of six water sources with

a range of diverse underlying geology. Annual rainfall from each relevant region will determine the volume of test water used for each column, with five repetitions to approximate five years of rainfall. After each eluate the water will be tested for pH, hardness, and alkalinity. These results will be compared to parallel tests of water samples from the six water sources to determine soil buffering capability depletion.

BOARD E THE POISONED WELL. COLIFORM BACTERIA/ *E. COLI* HAZARDS AND THEIR IMPLICATIONS. CHERYL L. WELCH, 5030 MARION-EDISON RD., MARION OH 43302.

Poisoning of water wells occurs everyday without warning. In this investigation, I tested for coliform bacteria in many wells around the Marion County area. After filtering and culturing the bacteria, I tested for aldehydes on the m-Endo petri dish which suggests coliform bacteria. If this test, and it's verification tests come back positive, I then tested for *Escheria Coli, Klebsiella pneumoniae*, nitrates, and *Pseudomanos aeriginosa*. Since Coliform Bacteria is an indoor bacteria, meaning that if coliform is present in a well, that other harmful disease-causing organism may also be present. After gathering the results, I then obtained well logs and mapped out Marion County showing trouble spots versus the fairly safe areas from sewage seepage. I did this by comparing my results with the County Health Departments, and coming up with reasonable ideas as to where. Then, using the well logs, I mapped out areas where the aquifer was sand, silt, clay, shale, and gravel. The aquifer is very important because septic sewage must go through the aquifer before reaching the water supply. Then I combined the two danger maps together into one map that shows the hazard areas of Marion County.

BOARD F INCREASING THE DEPTH EFFECT OF STEREOSCOPIC 3D IMAGES BY USING READING GLASSES. KAREN J. BOS, 6806 WINDSOR ROAD, HUDSON OH 44236.

Viewers of true 3D stereoscopic images often feel discomfort and see "double" images that they are unable to fuse. Computer programs have had difficulty overcoming this because it is caused by the difference between the accommodation (focus) point and the convergence point (inward rotation point of the eyes). Increased distances of the virtual image from the screen greaten this difference, and its problems. My hypothesis reasoned that by using low power correction glasses to change the accommodation of the viewers to a calculated distance behind the computer screen these problems could be reduced. Ten subjects were tested with common 3D glasses and with the improved 3D glasses. My results concluded that for almost all viewers the improved glasses helped them to see images closer to the set depth, and 60% of viewers found the improved glasses made images easier to fuse, while 10% of viewers preferred the normal glasses. Also, 60% of viewers preferred the improved glasses for less eye strain, and no viewers preferred the common 3D glasses. These results indicate that the improved glasses made many improvements for viewers of 3D images.

BOARD G HEAVY WEIGHT CONTENDERS: A LOOK AT FAT. DANIEL T. MOSS, 5388 HEADGATES RD., INDIAN SPRINGS OH 45011.

This investigation concerns the type of ground meat which contains the most amount of fat. I chose to study this because so many people are interested in dietary intake of fat and there is much discussion about which meat has the highest fat content. Many people are told that ground turkey is a healthier choice than ground beef or pork in food preparation. I wanted to see if this claim were true. The meat samples that I chose to investigate were ground chuck, ground hamburger, ground pork, and ground turkey. The experiments used 10 gm samples of each type of meat. I found the fat content in each meat sample by subtracting the weight of the empty petri dish from the weight of the petri dish with the samples of fat. After a series of three trials, I compared the results of each trial and then calculated the average based on those three trials. The results indicated that ground turkey had the greatest amount of fat and ground hamburger had the least amount. This information seemingly contradicts the information given to millions of diet conscious consumers.

BOARD H ALUMINUM: IS IT HAZARDOUS TO YOUR HEALTH? SHANNON M. CAMPBELL, 353 NORTH KING ST., XENIA OH 45385.

Aluminum is the third most abundant element in the earth's crust. Today aluminum is omnipresent, but its advantages are misleading. Current research has blamed aluminum for causing diseases that range from bladder cancer to Alzheimer's. This investigation was performed to see if the aluminum in pop cans and aluminum cookware does enter the liquid they contain. It was hypothesized that aluminum does enter the liquids in aluminum cans and cookware. This experiment was performed by testing seven different types of carbonated beverages and water boiled in aluminum cookware for three hours. Evry hour a sample was removed for testing. The cookware consisted of a new and an old aluminum pot. The colorimetric method was used to determine the concentration of aluminum, but only clear liquids were used because of the method of testing. The results showed that aluminum was present in carbonated beverages and in the water boiled in the cookware. It was concluded that aluminum existed in carbonated beverages and substances cooked in aluminum cookware, and that the concentration of aluminum increased with time.

BOARD I SPF MOISTURIZERS. ANNA SOLVEIG HILL, 5608 CHUKAR DR., DAYTON OH 45424.

Certain over-the-counter face moisturizers contain a sunscreen of SPF (Sun Protection Factor) 15. Do these moisturizers provide greater protection than a conventional sunscreen of SPF 15? It was hypothesized that the sunscreen would provide better UV (ultra-violet) protection than the face moisturizers, because the sole purpose of sunscreen is protection from the sun, while the moisturizers are for cosmetic reasons. Five different products were tested. Four were over-the-counter face moisturizers, with SPF 15; the fifth was a SPF 15 sunscreen. The experiment consisted of exposing UV sensitive paper, enclosed in a clear plastic cover, to direct sunlight with a 3 cm diameter circle of each product on top of the plastic cover. After the UV sensitive paper was exposed to the sunlight for a brief determined period, it was brought inside and photographed to record the results as a permanent record. The image that each of the products left on the UV paper constituted the degree of protection from the UV rays. These images were then compared to a "gray scale" generated by a computer printer. This scale was used to determine the level of UV protection that each product provided. From this comparison, it was determined that the SPF 15 sunscreen provided the best ultra-violet protection of all tested products, thus supporting the hypothesis.

BOARD J NOISE -- GOOD? BAD? MAYBE BOTH! BRIAN R. DULIN, ZANE TRACE HIGH SCHOOL.

Circuitry was developed to control noise based upon an understanding of how sound travels through a medium, certain electrical properties, and finally on how waves behave in the presence of other waves. Research on the properties of waves indicated that various electromagnetic and water waves interacted to enforce or cancel superimposed waves based upon their phase relationships. The trigonometric relationships concerning waves were evaluated and found to at least mathematically indicate my hypothesis could be correct. The underlying relationships can be expressed as: $Y_1 = A \cos(kx - \omega t)$ and $Y_2 = A \cos(kx - \omega t + g)$. In addition to $(kx - \omega t + \delta)$ covering the relative phase relationship of the waves, it was also utilized in considering how to process wave signals to force two waves into and out of phase with each other to study the resultant waves. Mechanical and electronic means of phase shifting (including researcher constructed circuits) produced very significant levels of noise cancellation over a range of frequencies. This research could lead to relatively inexpensive and light weight means of controlling traffic and industrial noises.

BOARD K DO SPECIFIC AMBIENT ODORS ENHANCE SHORT TERM MEMORY FUNCTION IN EARLY STAGE ALZHEIMER'S DISEASE PATIENTS? BRETT THOMAS PERALA, 600 EASTWOOD ST., GENEVA OH 44041.

It was hypothesized that short term memory in early stage Alzheimer's Disease patients would be enhanced when subjects were exposed to the ambient odors of peppermint, lemon, and rosemary during the administration of name/face recognition tests. Two separate tests were administered to live subjects who were identified as having the mental faculties as are indicative of the early stages of Alzheimer's Disease. The first test, consisting of five photographs with first names and occupations or hobbies was administered with no odor present. The second test, of the same format was administered while the subjects were in the presence of the ambient odors of the essential natural oils of peppermint, lemon, and rosemary. Test results indicated that when subjects were exposed to the ambient odor their scores improved overall. It was concluded that exposing early stage Alzheimer's Disease patients to the specific ambient odors of peppermint, lemon, and rosemary does have a measurable positive effect on the short term memory of the patients.

BOARD L OLFACTION; A LEARNED ASSOCIATION. KRISTEN E. HUMBACH, 2898 SHAFFER AVE., CINCINNATI OH .45211

New research has shown that olfaction through olfactory cortex and hypothalamic center evoke more emotion and behaviors than any other sense. In order to investigate my hypothesis, that olfaction is a learned behavior

developed by associations, I utilized rats due to their rhinenecphalon traits and possessing hypothalamic centers similar to humans. After the six rats were divided into four groups, ethograms were charted for over 56 days. One group was tested to determine whether short term memory could he transferred to long term memory. The second group tested whether positive and negative associations create positive and negative responses regardless of actual scent. The remaining two groups were controls. One control group provided a baseline of normal rat behaviors under experimental setting while the remaining group verified rat behaviors with test scents absent any association. Skunk and apple scents were used with associations of edible nutrients and loud auditory stimulation. Data documented that short term memory of olfaction was transferred to long term memory and negative smells with positive associations consistently produced positive responses while positive smells with negative associations produced negative responses. Olfaction is learned by associations. Other applications for assisting in learning and repairing memory loss are under study.

BOARD M THE EFFECTIVENESS OF SUBLIMINAL MESSAGES. ANDREW L. WARNOCK ,1483 DOBSON SQUARE NORTH, COLUMBUS OH 43229-1365.

This project was designed to test the effectiveness of subliminal messages. Subliminal messages in the form of video transmission are images or words that enter the subconscious. The images are perceived without the conscious knowing about it. This stimulus can alter decisions or make the mind feel as to need to do something. Last year, I believed subliminal messages would work most of the time. I felt that if a group of people were subjected to subliminal messages it would have an influence. However I proved the state in which the subject is in, and the surrounding environment makes it so it will not have a l00% effect. This year I attempted to see if normal, logical thought could be overridden by the subconscious to choose wrong answers as easily as correct answers. I believe this will not happen in most cases. To test subjects I created two computer programs of multiple choice questions. On the first test, I had ten questions that suggested wrong and ten questions that suggested right answers. The second test, a control test, did not have subliminal messages. By using this test, I compared my subliminally-altered results with normal, non-suggesting answers. The results showed that subliminal messages still do have an effect and that they can help direct the subjects' thoughts to making correct answers as well as making wrong answers.

BOARD N DEADLY WATER. RYAN D. YOUNG, 5815 NEW CARLISLE PK., SPRINGFIELD OH 45504.

Many people are not aware that acid rain is destroying all of our lives. It is killing our planet, and the blame lies with all of us, as does any hope of a solution. Air pollution mixed with moisture in the air, falls back to earth as acid rain, and it slowly kills our lakes, and the fragile plant life which people depend on for life giving nutrition. The goal of this investigation was to determine the best way of correcting acidified soil. I used an acid rain substitute (lemon juice), and watered 7 of 8 plants with it. My first plant was my control; it was watered with plain tap water. The rest of my plants were the acid rain plants. They had the following correction solutions added to the soil: limestone (plant 2), baking soda (plant 3), antacid (plant 4), limestone and baking soda (plant 5), limestone and antacid (plant 6), limestone, baking soda and antacid (plant 7), and just acid rain (plant 8; variable). These plant were watered daily and kept in a well lit area. The growth processes and color changes of each plant was monitored and the results were assessed and documented. The results indicated that the limestone, baking soda, and antacid solution provided the greatest degree of acid rain correction.

BIOLOGICAL SCIENCES DIVISION
ANIMAL BIOLOGY
9:00AM SATURDAY, MAY 4, 1996
TIMKEN SCIENCE HALL 271
P. BAGAVANDOSS - PRESIDING

9:00 COMPARATIVE MICROHABITAT ANALYSIS OF SYMPATRIC AND ALLOPATRIC SPECIES OF DESMOGNATHID SALAMANDERS. SCOTT E. SEEMAN AND LOWELL P. ORR, DEPARTMENT OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT OH 44242.

The geographic ranges of *Desmognathus welteri* and *D. auadramaculatus* come in close contact in southern West Virginia, but are thought to be mutually exclusive. Both species are believed to be ecologically similar in their preference for semi-aquatic habitats in high gradient mountain streams. *D. monticola* however, is sympatric with both species and is thought to prefer significantly more terrestrial stream-bank habitats. Microhabitat characteristics of these three species have been measured in southern West Virginia and southeastern Kentucky in order to clarify the ecology of *D. welteri*, which has not been quantified. Preliminary results suggest that *D. welteri* and *D. auadramaculatus* are not significantly different in their microhabitat preferences. However, *D. monticola* is significantly more terrestrial than either species. Competitive exclusion may help to explain the allopatric ranges of *D. welteri* and *D. quadramaculatus*. Further study is needed to determine whether or not both species share the same limiting resource.

9:15 GENETIC RESPONSES OF FISH IN SMALL STREAMS TO LANDSCAPE VARIATION. MARK M. MYERS, E. RAYMOND HEITHAUS, AND PATRICIA A. HEITHAUS, BIOLOGY DEPARTMENT, KENYON COLLEGE, GAMBIER OH 43022.

Past studies have revealed significant correlation's between patterns of allozyme variation in stream fishes and water quality as influenced by pollution. In Knox County (OH) agricultural practices may influence 80% of first- and second-order streams, with influences including removal of surrounding forest, altered water flow, sedimentation, and input of agricultural chemicals. Studying first- and second-order streams reduces upstream effects. In this study, we used allozyme electrophoresis to examine the responses of genetic parameters in *Etheostoma caeruleum* (Rainbow Darters), *E. nigrum* (Johnny Darters), and *Phoxinus erythrogaster* (Red-bellied Dace) populations in small streams surrounded by forested lands pasture, cultivated fields with vegetated riparian strips, and cultivated fields without riparian trees. Twenty streams were sampled in the Kokosing River drainage area in eastern Knox County. The most distant streams were >40 km apart. Twenty-four individuals of each species were collected from each stream, when possible. For variable enzyme systems, heterozygosity was near 12% for fish from streams surrounded by forested land but only 2% for fish from the streams in non forested habitats. Allelic polymorphism was low for all species at the spatial scale in this study.

9:30 INTERSTITIAL COLLAGENASE AND TYPE I COLLAGEN IN THE VERTEBRATE OVARY. P. BAGAVANDOSS, L.M. MEHLMANN*, D. KLINE*, AND B.C. BRUOT*, *DEPARTMENT OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY **STARK CAMPUS, CANTON OH 44720 AND *KENT OH 44240.**

The vertebrate ovary and the follicles in it consist of distinct cell types and an array of extra cellular matrix components. During the course of the reproductive cycle, the follicle matures, ovulates and transforms into the corpus luteum. During ovulation, the oocyte must breach the extra cellular matrix of the follicle before it can be released from the ovary. In this context, a role for interstitial collagenase, an enzyme that degrades type I collagen matrix, has been implicated in the mammalian ovary. However, the precise distribution of neither this enzyme nor the type I collagen matrix has been previously studied. Therefore, using specific antibodies, we have localized the interstitial collagenase and type I collagen in the rat ovary. Immature rats were primed with pregnant mare's serum gonadotropin (PMSG, 15 IU) in 100 µl of phosphate buffered saline (PBS). Two days later, to induce ovulation, some of these animals were injected with human chorionic gonadotropin (hCG, 5 IU/100 µl PBS). The animals were sacrificed at appropriate times, the ovaries were removed and processed for cryostat or paraffin sectioning. Type I collagen formed a dense wreath around the follicles and corpora lutea. The collagen matrix was also found in the interstitium and in the walls of the interstitial arterioles and venules. The interstitial collagenase was present in the oocyte and in the cells of the follicular wall. Endothelial cells in the interstitial blood vessels were also stained for the enzyme. The unique distribution of the interstitial collagen and the type I collagenase suggests that they might play key roles in ovarian physiology. More significantly, the presence of collagenase in the oocyte itself suggests that the oocyte most likely determines the site of ovulation on the follicular wall.

9:45 DEVELOPMENTAL DIFFERENCES IN RENAL RENIN GENE EXPRESSION IN HYPERTENSIVE AND NONHYPERTENSIVE RATS. TONY K. LEE, LIOMAR A.A. NEVES, MONTE E. TURNER, DAN L. ELY, AMY MILSTED, THE UNIVERSITY OF AKRON, DEPT. OF BIOLOGY, AKRON OH 44325-3908.

We established a developmental profile of renal renin mRNA levels for the University of Akron SHR and WKY strain rats and assessed whether these changes in the renin mRNA correlated with the presence of the hypertensive

Y chromosome, using the backcross strains SHR/y and SHR/a. We examined 1 day and 14 day old male pups from the SHR, WKY, SHR/a, and SHR/y rat strains. Kidney renin mRNA levels were quantified by Northern blotting, using a rat renin cDNA. Levels of renin mRNA were significantly lower in 14 day old rats compared to 1 day old rats, in each of the four strains. At day one, renin mRNA levels were highest in the SHR strain (1.31 +/- 0.09), followed by the WKY strain (0.73 +/- 0.06). The SHR/a and SHR/y strains (0.57 +/- 0.07, 0.45 +/- 0 05) were not found to be significantly different, but both were found to be lower than the SHR and WKY strains. At 14 days, levels of renin mRNA were not found to be significantly different between SHR/a and SHR/y (0.13 +/- 0.01, 0.11 +/- 0 01) or between WKY and SHR (0.48 +/- 0.06, 0.40 +/- 0.02) strains. However, renin mRNA expression was lower in SHR/a and SHR/y compared to WKY and SHR. At day one, levels of renin mRNA were lower in the WKY strain in comparison to the SHR strain. Separation of the hypertensive Y chromosome and the hypertensive autosomal components is associated with altered regulation of renin mRNA expression.

10:00 THE ORGANIZATION OF CHEMICALLY ACTIVATED FOOD SEARCH BEHAVIOR IN GOURAMIS. **Kurt M. Schmitt, Dr. Craig W. Steele and Dr. Carol Skinner, Department of Biology and Health Services, Edinboro University, Edininboro PA 16444.**

Many studies have determined the thresholds of detection by fishes for many stimulating substances; however, few have examined the influence of chemoreception on fish foraging behavior, and none on the ethological organization of food search and foraging behavior. Insight into these behaviors is gained through the study of the response of the blue gouramis to chemical stimuli. The blue gourami, *Trichogaster trichopterus* is used because it has unusual taste appendages in its extended pelvic fin rays. The chemical stimulus used was a solution of seven amino acids and taurine. The solution was introduced into the gourami tank in three different concentrations. Data were collected through observation and then analyzed to examine the influence of chemoreception on fish foraging, feeding, ethological structuring and optimal foraging theory.

10:15 POLYCHLORINATED BIPHENYL (PCB)-ASSOCIATED DEVELOPMENTAL IMPAIRMENT OF PHYSICAL, BIOCHEMICAL AND BEHAVIORAL PARAMETERS IN 15-60 DAY OLD RATS. **B.B. Pritts, D.A. Corey, L M. Juarez de Ku, and L.A. Meserve, Department of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.**

PCBs are xenobiotics that are ubiquitously dispersed throughout the environment and food chain. Female Sprague-Dawley rats were exposed to PCB in their diet from the day of conception as determined by the presence of sperm in the vaginal smear. This toxin is known to cross the placenta and is found in the breast milk. After weaning, pups continued to consume rat chow containing PCB or PCB exposure was terminated. Impairment of physical development compared to controls was measured by weight gain and food consumption, tail length, and anecdotal observation. Significant depression of circulating thyroxine (T_4) levels, important for normal growth and development, was noted in all PCB-exposed animals, as well as alterations in the development of the hypothalamo-pituitary-adrenal (HPA) axis response to stress. Choline acetyltransferase (ChAT), an enzyme associated with learning and memory, was depressed in 15 day PCB-exposed animals, but with T_4 replacement therapy, returned nearly to the level of controls. Without T_4 replacement, ChAT activity rebounded to control levels by 20 days of age. Despite this, behavioral assessment of learning and memory utilizing the Morris water maze and the radial arm maze demonstrated deficits in the PCB animals compared to controls up to 60 days of age. Thus, PCB exposure adversely alters many parameters in developing mammals and further study is indicated.

10:30 PACIFIC SALMON HARVEST CYCLES: SEPARATE SPECIES' CONTRIBUTIONS TO TOTAL LANDINGS. **John F. Wing, Wittenberg University, P.O.Box 720, Springfield OH 45501.**

Wing (l965) analyzed combined annual landings of Pacific salmon (*Oncorhynchus* spp) and steelhead (*Salmo gairdneri*) in the Columbia River Basin (CRB) as reported in Netboy (1971). He found significant (p<.01) 10-11 yr., 20-22 yr. and 30-34 yr. cycles. In this study the role of each of five species is considered. Chinook (*O tshawytscha*) contributed over 50% to landings in most years and showed the clearest evidence of cycles: for the 63-yr. period, 1870-1932, it showed 10,20, and 30-yr. cycles (p<.05 or better). The remaining species each contributed variably to the remaining 50% of each catch. The steelhead trout (*S. gairdneri*) showed 11, 22 and 34-yr. cycles (p<.05). The coho (*O. kisutch*) showed fairly clear cycles of these periods; but contingency tests revealed dominance of a 4-yr. cycle. The chum (*O. keta*) gave significant (p<.05) 9-10 yr. and 18-20 yr. cycles; but tests also revealed the 4-yr. cycle. Such a cycle was even more evident in the sockeye (*O. nerka*) too; but overall the contribution of coho, chum and sockeye to total landings was small and barely influenced the impact of the 10-20-30 yr. cycles of chinook and steelhead.

10:45 PROBABLE 10-12 YR. HARVEST CYCLE IN STELLAR SEA LION (*EUMETOPIAS JUBATUS*) IN BRITISH COLUMBIA. **John F. Wing, P.O.Box 720, Wittenberg University, Springfield OH 45501.**

Bigg (1988) summarized the annual kill of stellar sea lions in British Columbia (BC) for the years 1912-1915 and 1922-1968 as well as census counts for the years 1971-1982. The species favors exposed coastal sites and BC rookeries and haulouts extend all the way from SE Alaska to Washington. The kill series shows sharp ups and downs with lows about 1913, 1922, 1934, 1955, and 1966. The contingency periodogram test (Legendre et al, 1981) applied to residuals of the 1922-1968 kill gave significant (p<.05) 11-12 yr. and 23 yr. cycles. The kill residuals can be correlated with those of a number of cyclic prey. Residuals of N. Pacific total salmon catch correlated .343 (p<.05) and residuals of regional canned salmon pack also correlated positively; SE Alaska (.753, n-18, p<.001), BC(.200, n=38, n.s.), and Washington (.616, n=18, p<.01). The lower correlation for BC salmon may be because 1) all salmon destined for US rivers travel past the BC ocean-facing rookeries and haulouts while 2)only some BC salmon do while others come from the highly irregular catches in the BC inland passages.

Animal Biology
2:15PM Saturday, May 4, 1996
Timken Science Hall 271
John F. Wing - Presiding

2:15 DEVELOPMENT OF INTEGRATED PEST MANAGEMENT (IPM) AS A VIABLE ALTERNATIVE TO CHEMICAL CONTROLS OF ANIMAL AND PLANT PESTS. **George E. Klee, Dept. of Biol. Sciences, Kent State University-Stark Campus, 6000 Frank Ave., NW, Canton OH 44720.**

The publication of *Silent Spring* in 1962 by Rachel Carson and other similar books and articles later merely helped to dramatize the problems of resistance, environmental contamination, and increased costs that farmers, professional entomologists, and pest control operators were encountering during the 1960's as they attempted to continue controlling agricultural pests by predominantly chemical means. This paper will review some of the progress towards truly sustainable agricultural methods that have been made since the early "spray & pray" days of synthetic chemical control that occurred during the decade after W.W. II, up to the current situation in the US Midwest. It will include such data as the increasing numbers of IPM and Biological Control papers that have been presented at the Entomological Society of America's annual meetings, the increasing numbers of IPM articles that have been published in the ESA's journal, *Environmental Enomology*, and the increasing number of Entomology/Biol. Science faculty positions dedicated to research in IPM. The author will also outline some of his own observations of this profoundly changed discipline, from his early experiences on a working dairy farm, through graduate training in insecticide resistance, side-effects and soil ecology, up to currently working as a professional ecologist, board-certified entomologist and university biological sciences professor.

2:30 TEMPORAL DISTRIBUTION AND BEHAVIOR PATTERNS OF SEXUAL ACTIVITY OF GIANT CANADA GEESE IN OHIO. **Blake L. Bates and Philip C. Whitford, Biology Dept., Capital University, 2199 E. Main St., Columbus OH 43209.**

Most past descriptions of sexual behavior for Giant Canada Geese, **Branta canadensis maxima**, were incidental to other research and lacked adequate data to define timing, frequencies, and parameters of specific behaviors. our preliminary observations led us to question the long accepted belief that most sexual activity occurred before 10:00 am in this species. We also wished to define parameters of the precopulatory display in relation to copulatory success or failure. Using two hour block sample formats between 0600 and 1800 hours, 160 hours of observations of resident geese were conducted on a 4 hec lake within a closed refuge at Blendon Woods Metro Park, Columbus, Ohio, 15 March to 5 May ,1994. Five hundred and twenty six precopulation sequences observed evidenced a 71.7% copulation success rate. Neck-dipping rates and synchrony varied between pairs and yet had little influence on success of copulation attempts. When adjusted to equal hours of

observation for all time blocks, 26.3% of copulation attempts occurred before 1000, 48.1% before 1200. Peak copulation rates were observed 1000-1200 (21.7%) and 1200-1400 hours (21.2%), with 16.9% and 13.8% occurring from 1400-1600 and 1600-1800 hours, respectively. These results indicate a strong morning bias in past observations causing underestimates of sexual behavior frequency for the species.

2:45 TRANSFERRIN POLYMORPHISMS AS GENETIC MARKERS FOR ECOLOGICAL STUDIES OF WOOD DUCKS. **Courtenay N. Willis, David W. Waller, and Lowell P. Orr, Department of Biological Sciences, Kent State University, Kent OH 44242.**

Genetic markers may be used to examine population structure and to discriminate between populations. We are using transferrin polymorphisms to describe patterns of geographic variation in wood ducks (*Aix sponsa*). We expect to find geographic variation in allele frequencies due to limited female-mediated gene flow. Gene flow may be low between populations because females return to nest at their natal site. Variation in transferring is being examined in four populations of wood ducks nesting in Ohio. These are located at Ottawa National Wildlife Refuge, the Ravenna Army Ammunition Plant, Mosquito Creek Wildlife Management Area, and Berlin Wildlife Management Area. Serum has been collected from female wood ducks that nest in artificial nesting structures. After processing, samples were stored at -70°C until electrophoretic analysis. Samples were run on native polyacrylamide gels alongside purified transferrin for comparison. Transferring were isolated using Western blot analysis. Electrophoretic analyses revealed a variable electromorph exhibiting a stereotypical transferrin pattern: 2-banded homozygotes (representing the iron saturated and unsaturated proteins) and either 3- or 4-banded heterozygotes.

3:00 PACIFIC DRAINAGE BASIN, I: SYNCHRONY IN SALMON HARVEST CYCLES, 1877-1971. **John F. Wing, Wittenberg University, P.O.Box 720, Springfield OH 45501.**

Canned salmon records for Alaska, BC, Washington, Oregon and Northern California were taken from Gregory and Barnes (l939), Marts and Sewell(1960), and Netboy(1971). Trends were removed and residuals were intercorrelated for evidence of regional correspondences including near-synchrony of any cycles. In locations where catch or counts were also available these were used to validate the proxy cannery measures. Validation correlations ranged from: .806-.937 (all p<.001). Results showed O-lag inter correlations were mostly moderate and significant (P<.05) between adjacent regions but mostly low positive and less frequently significant for more distant regions; however shift in lag of only 1-2 years raised magnitude and significance. Graphs showed six cycles of salmon production from 1877-l938. Long records (48-yrs or longer)showed 10-12 yr. and 20-24 yr. cycles at p<.10 or better, but only the Alaska and BC series reached the .05 level or better for both cycles. A short N. California Coast record gave a 10-yr. (p<.01) cycle with a strong 5-yr. (p< 01)sub-cycle. Thus cannery production showed evidence of regional cycle synchrony but with slightly lower correlations than actual catch records.

3:15 PACIFIC DRAINAGE BASIN, II: SYNCHRONY IN RIVER OTTER HARVEST CYCLES, 1934-1983. **John F. Wing, Wittenberg University, P.O.Box 720, Springfield OH 45501.**

Wing found (l)residuals of fur harvests for seven mammals in the Columbia River Basin (CRB) showed 10-12 yr. cycles and (2) residuals of total salmon landings also displayed 10-12 yr. cycles. The latter correlated positively with five of the furbearers, most importantly the mink (p<.05) and otter (p<.0l). Wing also intercorrelated residuals of canned salmon records for six sites in the Pacific drainage basin (PDB) and found five of the fifteen correlations were significant as well as finding near-synchronous cycling. It follows that harvests of salmon-feeding furbearers also might cycle in unison in the PDB. This study presents O-lag intercorrelations of otter harvest residuals for five regions: Alaska, BC, Washington, Oregon and California. Correlations ranged from -.025 to .451. Six of the ten were significant (p<.05 or better) and seven were of moderate size (.301 to .451). When otter harvests from adjacent intermountain states were added to the matrix the new resultant correlations were of lower and marginally fewer were significant, suggesting the PDB is a fairly homogeneous region.

3:30 PACIFIC DRAINAGE BASIN, III: POSSIBLE CAUSES OF SYNCHRONOUS CYCLING OF FAUNAL HARVESTS. **John F. Wing, P.O.Box 720, Wittenberg University, Springfield OH 45501.**

Wing (1965) has shown that for over 50 years at least six furbearers have displayed 10-12 yr. and 20-24 yr. cycles in the Columbia River Basin. Most of these animals are predators scavenging on Pacific salmon (Cederhohn et al, 1989). Wing (1966a) also has shown synchronous cycling in both salmon and otter harvests which extend beyond the CRB to include the entire Pacific Drainage Basin (PDB). Further, these synchronous cycles extend to the off-shore islands of BC as shown in the kill record of the Stellar sea lion (Wing, 1966b). This paper presents some possible causes of such synchrony. Emphasis is on vanLoon and Labitzke's (1994) report of a 10-12 yr. cycle in middle atmospheric pressure, its control over Hadley circulation, and hence its consequences (1) on the Alaskan gyre, coastal upwellings, and pelagic biomass and (2) Alaskan lows affecting inland weather patterns and hence faunal harvests.

Aquatic/Microbial Ecology 9:00AM Saturday, May 4, 1996 Timken Science Hall 251 Arthur L. Vorhies - Presiding

9:00 THE HYDROPHOBIC NATURE OF BACTERIAL COMMUNITIES IN TWO OHIO STREAMS. **Christopher J. McNamara, Michael J. Lemke and Laura G. Leff, Department of Biological Sciences, Kent State University, Kent OH 44242.**

The hydrophobicity of bacterial cell surfaces can influence factors such as adhesion to surfaces and nutrient utilization. The purpose of this study was to compare the surface hydrophobicity of bacteria from different stream communities. Three habitats (course rock substrate, fine depositional sediments and water) from two streams (Bixon Creek and Mahoning Creek) were sampled. Bacteria were dislodged from the rock and sediment samples using sonication and 0.1ml of each sample was plated onto modified nutrient agar. Colonies were transferred to modified nutrient broth and the hydrophobicity of samples was determined by measuring the difference between the optical density before and after mixing with n-octane. 13% of the bacteria were found to be hydrophobic. 61% of these hydrophobic bacteria were found in the water column. 74% of all bacteria were Gram-negative and identified using API-NFT strips. *Sphingomonas paucimobilis* and *Chryseomonas luteola* were identified as hydrophobic bacteria. The low numbers of hydrophobic bacteria found in the substrate samples suggest two possibilities: 1) more hydrophobic bacteria live in the water column than on substrates or 2) methods other than sonication may be necessary to remove hydrophobic bacteria from these surfaces.

9:15 TEMPORAL PATTERNS OF *BURKHOLDERIA CEPACIA* ABUNDANCE IN TWO OHIO STREAMS. **Adam A. Leff and Laura G. Leff, Kent State University, Trumbull Campus, 4314 Mahoning Ave, Warren OH 44483.**

The abundance of *B. cepacia* was determined in two Northeastern Ohio streams, the Mahoning River and Bixon Creek. Midstream surface waters were sampled monthly for one year. Stream water was examined for bacterial abundance by the following methods: fluorescence microscopy for total bacteria, plate counts for culturable bacteria (CFU's), and colony hybridization for *B. cepacia* using a species specific-rRNA gene probe. The number of CFUs isolated on modified nutrient agar were highest Nov. through Jan. and dropped when streams were ice covered during late winter. Number of CFU's rose during the spring and were relatively low during the summer and fall. Total bacterial numbers followed similar trends; peaking during the winter and spring and declining during periods of ice cover. However, total numbers remained at moderate levels during the summer and fall, suggesting a higher percentage of dormant or inactive cells. The percentage of total bacteria which were *B. cepacia* ranged from 0--24%, averaging 11% for the winter and spring and 0% during the summer months. Water turbidity and flow were lowest during the summer months indicating that *B. cepacia* may be associated with particulates and originate from sediments or allocthonous sources.

9:30 DETECTION OF PHOSPHORUS LIMITATION OF BACTERIAL GROWTH IN LAKE ERIE. **Xueqing Gao and Robert T. Heath, Dept. Biol. Sci. and Water Res. Res. Inst., Kent State University, Kent OH 44242-0001.**

Whether natural populations of aquatic bacteria are growth limited by P-availability is an unresolved issue, important for both scientific and practical purposes. We investigated the feasibility of using bacterial productivity and

relative amount of cellular RNA content as sensitive indicators of P-limitation. In laboratory studies, we cultured *Escherichia coli* strain B in a minimal medium (M9) and placed cells into M9-P to produce P-limited cells. Rate of ^{3}H-leucine incorporation into protein was used to measure bacterial productivity. Relative RNA content was estimated with acridine orange, a metachromatic fluorescent stain (DNA: green; RNA: red). We found these were sensitive indicators of bacterial P-limitation. Using these procedures, we found that natural bacterioplankton populations from nearshore and offshore stations in Lake Erie were not P-limited. This research was supported by the Ohio Sea Grant College Program.

9:45 A COMPARISON OF THE BACTERIAL ASSEMBLAGE OF A SPRING AND A STREAM. **Heather A. McEwen and Laura G. Leff, Department of Biological Sciences. Kent State University, Kent OH 44242.**

Cold water springs represent an environment that is different from streams fed from run-off. Springs are more stable in chemical composition, water velocity, and temperature. Spring bacterial assemblages may be dominated by cells from groundwater and stream assemblages may contain a higher proportion of soil bacteria carried in by run-off. Because gram positive bacteria are more abundant in soils, by comparing gram staining results between a spring and a stream the importance of soil bacteria may be determined. Water and rock samples were collected from Triple Springs Stream at West Branch State Park from the eucrenon and a stream site farther downstream. Bacteria were cultured on modified Nutrient Agar (mNA) and colony forming units were enumerated. Thirty-three individual bacteria colonies from each sample were subjected to gram staining. The total percentage of gram positive bacteria from the eucrenon (water=38%; rock=43%) was no significantly different from the stream site (water=37%; rock=46%). The results of the study suggest that there is not a significant amount of gram positive bacteria being introduced to the stream by run-off.

10:00 LANDSCAPE SCALE AND MICROBIAL ECOLOGY. I. NITROGEN TURNOVER. **Sherri J. Morris, Jennifer A. Brinkman, and Ralph E.J. Boerner, Department of Plant Biology, Ohio State University, 1735 Neil Ave., Columbus OH 43210.**

The development of predictive models of global environmental change requires an explicit understanding of the various spatial and temporal scales at which natural or anthropogenic changes operate. As part of a larger study of scale processes in southern Ohio oak forests, we evaluated the variations in microbially-mediated N mineralization and nitrification on three spatial scales: (1) regional scale, i.e. among four similar forested areas, (2) local scale, i.e. among three similar and contiguous watersheds within each forested area, and (3) topographic, i.e. along gradients of elevation and moisture within each watershed. While N mineralization and NH4 pool sizes varied significantly only at the regional scale, NO_3 pool sizes and nitrification varied significantly at all three scales. These results support the hypothesis that ecological processes which depend on a small guild of specialists (such as nitrification) will vary more in space and time than processes mediated by large, diverse guilds (such as mineralization). Thus, different nutrient cycling processes should be expected to operate at different combinations of scale, and this must be considered when designing sampling schemes and in paramaterizing models to predict effects of environmental change on these processes.

10:15 LANDSCAPE SCALE AND MICROBIAL ECOLOGY. II. SOIL ENZYME ACTIVITY. **Kelly L.M. Decker, Michael J. Fisher, and Ralph E.J. Boerner, Department of Plant Biology, Ohio State University, 1735 Neil Ave., Columbus OH 43210.**

In this portion of the larger study of scale processes in southern Ohio oak forests, we determined the scale dependency of three major enzyme systems in soil (β-glucosidase/BG, acid phosphatase/AP, and chitinase/CH) as a means of evaluating microbial community structure variation across scales. In addition to the three levels of spatial scale utilized above (regional, local, and topographic), we also evaluated microscale variations by taking samples 0.5m upslope and downslope of a single red oak (*Quercus borealis*) tree in each of 36 sampling areas. Activity of all three enzymes and soil organic matter (OM) content differed significantly at the regional level, with the higher enzyme activities being associated with the lowest organic matter content. Activity of all three enzymes also varied significantly among continuous watersheds. AP and CH activity varied significantly among plots along the elevation/moisture gradient, with greatest activities in the driest sites. At the microscale, activity of AP and OM were significantly greater 0.5m downslope than upslope, of a given oak. The same was true for BG in two of the four forested areas. Although these results suggest that microbial community structure varied significantly at all scales from regional to microscale, there was less of a tendency for microclimate variations along elevation gradients to be important than was the case for N turnover.

10:30 Poster Break

Aquatic Ecology/Entomology
2:15PM Saturday, May 4, 1996
Timken Science Hall 251
Kenneth A. Krieger - Presiding

2:15 BURROWING MAYFLIES (EPHEMERIDAE: *HEXAGENIA* SPP.) IN WESTERN LAKE ERIE: RECENT RANGE EXPANSION AND POTENTIAL LIMITING FACTORS. **Kenneth A. Krieger and Don W. Schloesser, Water Quality Laboratory, Heidelberg College, Tiffin OH 44883.**

Burrowing nymphs of the mayflies *Hexagenia limbata* and *H. rigida* were widespread and abundant in the western basin of Lake Erie prior to the mid-1950s. Following a catastrophic decline in their populations beginning in 1953, the nymphs disappeared from most of the basin by the mid-1960s, being restricted to a few small, widely disjunct populations near shore. Low summer oxygen concentrations, and possibly toxic contaminants, appeared to cause this decline. Sediment samples collected in 1991, 1993 and 1995 revealed a rapid recolonization of the western basin by *Hexagenia* nymphs beginning in the early 1990s. In 1991 the nymphs appeared to be limited mostly to disjunct populations along the Canadian shore and beyond the mouth of the Detroit River. In 1993 several small populations were found near the western and southern shores and beyond the mouths of the Detroit and Maumee rivers, with a larger population in the southern island area. Nymphs were absent in the middle of the basin. By 1995 nymphs were found throughout the western half and eastern end of the basin but were still absent in mid-basin. These data indicate that *Hexagenia* was migrating lakeward from nearshore areas. The range expansion probably reflects improved sediment and water quality that have resulted from pollution abatement programs begun in the 1970s, and possibly from environmental changes associated with the invasion of zebra and quagga mussels (*Dreissena* spp.). Recent data suggest that oxygen dynamics may continue to limit the distribution of *Hexagenia* in parts of the basin.

2:30 A SURVEY OF THE RIFFLE INSECTS OF THE NIMISHILLEN CREEK IN STARK COUNTY, OHIO. **Eric G. Chapman and James G. Brooks, Dept. BSCI, Kent State University, Kent OH 44242.**

A 12 month survey of the Nimishillen Creek was conducted in 1991 to determine the diversity of riffle insects. Sixteen selected sites on the Nimishillen's East, Middle and West Branches were kick sampled 10 times at approximately 5 week intervals beginning on January 26, 1991. Two kick samples were taken from each site on each sampling date. Of the 64,018 insects collected and identified, 40 families and 67 genera were found. A Hilsenhoff water quality index was calculated for the samples taken on April 1. Index values indicated fair water quality (fairly significant organic pollution) in East and Middle Branches, and fairly poor water quality (significant organic poilution) in West Branch and below the confluence of the branches.

2:45 A SURVEY OF STREAM MACROINVERTEBRATES IN A FRESHWATER WETLAND (LIMROD). **Matthew W. Johnson and Lin Wu, Department of Biology, Mount Union College, Alliances OH 44601.**

Limrod marsh is a lower perennial, riverine wetland located in rural Columbiana County, Ohio. The two streams located in the marsh were sampled for limnological parameters and macroinvertebrates from May to September, 1995. Temperature and dissolved oxygen were similar between the streams, but they differed in flow velocity. The stream #1 had much slower flow velocity than the streams #2. Despite the close proximity of the two streams, our results of Shannon's diversity index suggested that the diversity of macroinvertebrates we higher in stream #1 than in stream #2 during the period sampled. Jaccard's similarity index further revealed that the two streams were consistently different. The dissimilarity between the two streams may be due the nature of the substrate, which is influenced by the flow velocity.

3:00 A PRELIMINARY SURVEY OF AQUATIC INSECTS IN TWO BELIZIAN STREAMS. Heather Moran and Robert Murray, Department of Biology, 310 E. Market Street, Tiffin OH 44883.

Collections were made from two third-order streams in the Coxcomb Basin, Maya Mountains, Belize, C.A. While similar in size and depth, the streams were quite different in substrate, canopy cover and water chemistry. Samples of insects were taken from five-meter transects in both riffle and leaf litter areas; the two streams showed significant differences in both species diversity and total numbers. For example, in the leaf litter of the Coxcomb Branch, three families of Trichoptera comprise almost 50% of the fauna; riffles of the same stream show less than 15% of that same fauna. Conversely, Coleoptera and Ephemeroptera together make up nearly 70% of the riffle system insect fauna while comprising only 35% of the leaf litter fauna. Similar differences can be found between the two habitats within the second steam (Mexican Branch) and also between similar habitats in the two different streams. To date, two new species of Elmidae (Coleoptera), one new Dryopidae (Coleoptera) and one new species of Lutrochidae (Coleoptera) have been identified.

3:15 UTILIZATION OF SNAILS OF THE FAMILY SUCCINEIDAE BY LARVAE OF HIGHER DIPTERA. Benjamin A. Foote, Department of Biological Sciences, Kent State University, Kent OH 44242.

Snails of the pulmonate family Succineidae are common in freshwater and terrestrial habitats where they are heavily preyed upon by at least eight species of higher Diptera. The life histories of representative species will be presented. Larvae of Sciomyzidae are mostly overt predators, whereas those of the Calliphoridae have more parasitic habits. Resource partitioning involving the trophic, temporal, and spatial dimensions will be discussed.

3:30 DETERMINING THE POST MORTEM SUBMERSION INTERVAL OF CARCASSES IN AN OHIO STREAM. J.B. Keiper, E.G. Chapman, and B.A. Foote, Dept. of Biological Sciences, Kent State University, Kent OH 44242.

Although insects can be used to determine the post mortem interval of a corpse in a terrestrial setting, no such method exists for determining how long a corpse has been submerged in a stream. To obtain data for determining this twenty adult rats were placed in Bixon Creek located in northeastern Ohio. Ten were left in a riffle and ten in a pool. One rat from each site was recovered on a predetermined schedule so that the last two rats retrieved were in the water for 40 days. All macroinvertebrates were removed from the carcasses and identified. Chironomidae (Diptera) was the dominant taxon present and was found to be useful in determining the post mortem submersion interval (PMSI). The generic composition of chironomids between the riffle and pool was dissimilar. Although the change of total numbers of individuals over time gave no accurate indication of the PMSI, the generic diversity on the riffle and pool rats each increased to above three genera after 33 days. Also, *Orthocladius* spp. appeared only after 15 days on the riffle rats. A carcass developed very little biofilm during the first 6 days of submersion. These data can aid in criminal investigations involving a corpse submerged in a stream.

3:45 A COMPUTERIZED GEOGRAPHICAL DATABASE FOR THE OHIO ODONATA SURVEY. Dave McShaffrey, Biology Department, Marietta College, Marietta OH 45750.

The Ohio Odonata Survey has compiled a database of over 18,000 records since 1989. Records are being added as additional museum specimens are cataloged and field collections are made. The database supports recommendations to the ODNR Division of Wildlife regarding endangered species status and protection of critical habitats. Custom software supports decision-making and helps target future collections. Reports are produced listing the data by species, county, site, and by habitat, among others. Graphical representation is possible via a simple geographic information system (GIS) that plots data on a map showing Ohio and all 88 counties; the flight period of each species is plotted simultaneously. The software and database can reside on desktop and laptop computers and were written using Visual Basic and Access in the Windows environment. The system is being enhanced by adding latitude and longitude data for each record either through field determination of location (by use of the globai positioning satellite system [GPS]) or through identifying past collection sites on a commercial map program. The enhanced software is running in prototype form for Washington County, Ohio, and plots exact collection sites on the map. Naturalists with similar needs should be able to develop a similar system for under $3,000 (US).

4:00 FREQUENCY AND DIVERSITY SURVEY OF ALGAL GENERA IN CONSTRUCTED WETLAND BASINS AT OLENTANGY RIVER WETLANDS RESEARCH PARK. John A. Kantz, Jr. and Robert Deal, Department of Natural Science, Shawnee State University, Portsmouth OH. 45662.

This six month survey was conducted in the two constructed wetland basins at Olentangy River Wetlands Research Park in Columbus, Ohio. Fourteen total mat and plankton samples were taken once a month from specific sites in both basins and drainage swale from June through November, 1995. These data include monthly frequency trends of 78 observed genera from six Divisions. This data will serve as a base for comparisons with future yearly surveys and will be used for a 1995 dynamics study of the wetlands. Also noted is a diversity comparison between a basin that had rushes planted, another basin that was allowed to develop naturally, and the shared drainage area (swale).

4:15 DO HETEROTROPHIC PROTOZOA RELEASE MAJOR QUANTITIES OF DISSOLVED ORGANIC PHOSPHORUS IN LAKE WATER? Helen L. Happ and R.T. Heath, Dept. Biol. Sci. and Water Resources Res. Inst., Kent State University, Kent OH 44242-0001.

This study investigated the hypothesis that heterotrophic protozoa (HP) are major producers dissolved organic phosphorus (DOP) compounds by "sloppy feeding" on bacteria. Rate of DOP production was estimated radiometrically, after addition of ^{32}P-phosphate to lake water drawn from 1-7 m depths in East Twin Lake, a mesotrophic kettle lake. HP densities were determined by primulin staining and epifluorescence microscopy. DOP produced in 30 minutes did not correlate to densities of HP with depth. DOP production was highest at the epi-metalimnion interface; HP densities were highest at the meta-hypolimnion interface. When HP were increased above ambient densities no significant increase in rate of DOP production was measured. These findings suggest that HP were not responsible for DOP generated in East Twin Lake's pelagic system This study was supported by the Ohio Sea Grant College Program.

4:30 EFFECTS OF ZEBRA MUSSELS (*DREISSENA POLYMORPHA*) ON PHOSPHORUS DYNAMICS OF LAKE ERIE PLANKTON COMMUNITIES. Robert T. Heath, Helen Happ, and Xueqing Gao, Water Resources Res. Inst and Dept. Biol. Sci., Kent State Univ., Kent OH 44242-0001.

The influence of zebra mussels (ZM) on nutrient cycles is not well known. Here we report that P-dynamics of natural plankton communities, sampled 1 m above dense ZM populations in the western basin of Lake Erie (LE), differed greatly from those characteristic of LE before invasion of ZM. SRP concentrations were elevated: 8.8 μg P L^{-1} (280 nM), and phosphate uptake was greatly slowed (bacterial: 0.02 nM min^{-1}; algal: 0.04 nM min^{-1}). Release of nascent DOP and uptake of ^{32}P-ATP also were greatly slowed in comparison with other LE plankton communities. Our findings suggest that ZM exert long-term effects on P-dynamics. Our findings are consistent with the view that ZM are "keystone remineralizers", excreting sufficient quantities of phosphate that may release remnant phytoplankton populations from control by P-availability. This study was supported by the Ohio Sea Grant College Program.

Reproductive Botany - History of Botany
9:00AM Saturday, May 4, 1996
Timken Science Hall 240
Robert Klips - Presiding

9:00 INBREEDING DEPRESSION IN TWO ROSE MALLOWS. Robert A. Klips, Department of Biology, Denison University, Granville OH 43023.

The reduced fitness of progeny produced from selfing is an evolutionary force that helps shape the mating system of many self-compatible plant species. The rose-mallows (genus *Hibiscus* section *Muenchhusia*) bear large self-compatible insect pollinated hermaphroditic flowers that bloom for one day, possess simultaneously mature anthers and stigmas, and have a mixed mating system. To determine whether inbreeding depression may have influenced the maintenance of features that foster outcrossing, progeny produced

by inbreeding were compared to progeny derived from outcrossing in several populations of two *Hibiscus* species: *H. grandiflorus*, which is restricted in distribution to the southeastern Atlantic and Gulf coasts, and the widespread *H. moscheutos*. Both taxa exhibited depression in two components of fitness expressed late in the life-cycle: seed germination and progeny growth. The populations that were more strongly affected by inbreeding were the more southerly ones, suggesting that the more northerly ones may have gone through bottlenecks and so been purged of deleterious alleles and/or the beneficial polymorphisms as they re-colonized the region following glacial retreat. Inbreeding depression appears likely to be maintaining floral features which result in a substantial fraction of outcrossed offspring.

9:15 INBREEDING DEPRESSION AND SELFING RATES IN A SELF-COMPATIBLE, HERMAPHRODITIC HERB, *SCHIEDEA MEMBRANACEA* (CARYOPHYLLACEAE). **Theresa M. Culley, Department of Plant Biology, The Ohio State university, 1735 Neil Ave., Columbus OH 43210.**

Contrary to the assumptions of most theoretical models, inbreeding depression and selfing rates may not be constant in a population. Phylogenetic analysis offers an opportunity to study how levels of inbreeding depression (IBD) and selfing rates change over time. Levels of IBD and selfing rates were measured in a hermaphroditic species, *Schiedea membranacea*, and compared to estimates suggested by phylogenetic analysis. IBD was hypothesized to be low in *S. membranacea* because of widespread occurrence of selfing in related species. Eleven individuals were hand-pollinated in the greenhouse with pollen from the same plant (self) and pollen from a different individual (outcross). The selfing rate was determined using starch gel electrophoresis. IBD was evident throughout the stages measured (percent viable seeds per capsule, mean seed mass, percent seed germination, percent seedling survival, and floral biomass). While the mean level of IBD was approximately 0.70, maternal families showed various levels of IBD, ranging from 0.0 to 0.97. IBD varied within family according to the cross type with a significant interaction of family and cross. On the basis of high genetic variability in maternal sibships, it appears that this species is highly outcrossed. Because the measured level of IBD is much higher than the value suggested by phylogenetic analysis, an increase in the mean level of IBD and a decrease in the selfing rates may have occurred over time. In combination with high outcrossing rates, high levels of IBD may explain the maintenance of hermaphroditism and outcrossing in *S. membranacea*.

9:30 POLLINATION ECOLOGY OF *PEDICULARIS PARRYI PURPUREA*. **Lazarus W. Macior, Department of Biology, University of Akron, Akron OH 44325-3908.**

The pollination ecology of *Pedicularis parryi purpurea in* association with *P. bracteosa paysoniana* was studied in the summer of 1995 in Teton Co., Wyoming. As in a prior study of *P. bracteosa, P. parryi* was found by insect exclosure to be pollinator dependent. Both plants bloomed synchronously in adjacent habitats, *P. bracteosa* in a moist willow thicket and *P. parryi* in a drier sagebrush upland. Nectar analysis by refractometry yielded very similar total sugars; thin-layer chromatography identified glucose and fructose in both nectars plus sucrose in *P. perryi. P. parryi* corolla tubes were short (8-11mm, mean 9.8) compared to those of *P. bracteosa* (17-21mm, mean 19.0). Bumblebees (*Bombus Latr.*) were the sole pollinators of the personate flowers. Nectar foragers pollinated nototribically, pollen foragers sternotribically by scraping pollen from anthers concealed in the galea. Of 244 pollinators on *P. parryi*, 13 *Bombus* queens foraged for nectar; all other bees collected pollen. On *P. bracteosa*, of 147 pollinators, 129 queens and workers foraged for nectar. On both plants, nectar foragers were mostly long-tongued (8.15-11.36mm). Analysis of corbicular pollen loads indicated 55% foraging constancy on *P. parryi* and 32% on *P. bracteosa*. Ultraviolet (360nm) reflective patterns from corollas were distinct for each plant. Frequency of *Bombus* species on both plants ranged from 1.8% to 25%; eight pollinator species were identified. Pollinator selection of *P. parryi* and *P. bracteosa* as primarily pollen and nectar sources, respectively, is apparent. The factors contributing to this selection, however, require further investigation.

9:45 *AUREOLARIA PEDICULARIA*: WHAT SPECIFIC PLANT(S) DOES THIS PLANT PARASITIZE AND HOW DOES THIS RELATE TO ITS RESTRICTED HABITAT? **Jody A. Drouhard and Steven R. Spilatro.,BOX 541 Marietta College, Marietta OH 45750.**

A hemiparasitic flowering plant with only two known populations in Ohio, *Aureolaria pedicularia* is a root parasite with a narrow host range. However, little research has been done to identify the host range of this hemiparasite. This plant has threatened status in Ohio, and knowledge of its host range could potentially aid in the development of strategies for its preservation. This project seeks to determine the host range of *Aureolaria pedicularis* through histological comparison of host roots and roots of potential hosts. Root collections were made from the Athens county population site. Procedures are being developed to embed these root samples in LR White, a plastic resin, and to differentially stain the sections. Preliminary results indicate perennial hardwood species serve as hosts for *Aureolaria pedicularia*.

10:15 A SCIENTIFIC SUCCESS STORY: THE ERA OF HYBRID CORN IN OHIO, 1924-1966. **Christopher M. Cumo, 4888 4th Street NW., Canton OH 44708-3439.**

The most important achievement of United States' agricultural experiment stations has been the development of hybrid corn. The powerful new technique of crossing inbred lines of corn to induce heterosis not only enabled corn breeders to derive high-yielding corn, but to derive insect- and disease-resistant corn. The remarkable success of hybrid corn resulted at least partly from the work of talented, and too often obscure, corn breeders. This paper seeks to remedy this oversight in one case by introducing Glen H. Stringfield, a corn breeder at the Ohio Agricultural Experiment Station between 1924 and 1959. When he began his work in 1924, Ohio's corn yield averaged only twenty-seven bushels per acre. The European Corn Borer was present in forty percent of the state's cornfields, and in 1927 the Ohio Department of Agriculture estimated that it decreased yields by twenty percent that year. In this alarming context Stringfield developed nearly sixty inbreds resistant to the Borer's first brood, most notably Oh43. In addition, he derived several highly resistant hybrids, most notably the early maturing OhioK62. In many cases these inbreds and hybrids surpassed Stringfield in longevity. In 1956 Oh43 was the second most widely used public inbred in hybrid crosses, and in 1964 it ranked first among public inbreds. In 1958 OhioK62 was planted more extensively in Ohio and Indiana than any other public hybrids. As late as 1988 the Iowa Agricultural Experiment Station still used Oh43 in its breeding program. As a result of his work, when Stringfield retired in 1959 Ohio's corn yield had climbed to 62.5 bushels per acre, more than double the yield at the start of his career. Concomitantly, Borer damage to corn in Ohio diminished from 8.5 million to 600,000 dollars between 1954 and 1965. The development and spread of hybrid corn in Ohio provides a case study of the value of publicly-funded agricultural science.

10:30 EMANUEL D. RUDOLPH'S CONTRIBUTION AS AN ABSTRACTOR FOR BIOLOGICAL ABSTRACTS. **William R. Burk, Biology Library, University of North Carolina, CB#3280 Coker Hall, Chapel Hill NC 27599-3280.**

The life of Emanuel D. Rudolph (1927-1992), noted polar lichenologist and historian of botany, is well documented by Ronald L. Stuckey (The Bryologist 97: 437-446. 1994; The Michigan Botanist 34: 4-23. 1995). Additional insight into Rudolph's scholarly endeavors is reveled through his contribution as an abstracter for Biological Abstracts. In 1952 while he was a graduate student in the Henry Shaw School of Botany at Washington University and the affiliated Missouri Botanical Garden in St. Louis, Rudolph accepted the intellectual challenge of preparing abstracts for Biological Abstracts. During 1952-1977 he prepared abstracts for 6 botanical serials (2 of them in Spanish) and 1 antarctic serial. A search in Biological Abstracts for articles appearing in serials for which Rudolph prepared abstracts located 382 abstracts written by him. Except for a few unsigned abstracts written in the late 1960's. his abstracts were signed "E.D. Rudolph," and varied in length from one sentence to a whole column of text. This paper reviews some background on abstracting at Biological Abstracts and chronicles and assesses Rudolph's role as a volunteer abstract or for Biological Abstracts/BIOSIS. Through his abstracts Rudolph served his fellow biologists and the scientific community and provided essential volunteer assistance at a time when Biological Abstracts was still seeking stability as a self-sustaining organization.

10:45 CELEBRATING 100 YEARS OF THE F. T. STONE LABORATORY: PRESIDENT GEORGE W. RIGHTMIRE'S EFFORTS DURING SIX YEARS TO HIRE THE FIRST FULL-TIME DIRECTOR (1930-1936). **Ronald L. Stuckey, Herbarium, The Ohio State University, 1315 Kinnear Road, Columbus OH 43212.**

In 1925, when Julius F. Stone donated Gibraltar Island to The Ohio State University for an aquatic field Biological Laboratory, he envisioned a facility second to none in America. The University's Board of Trustees and its president accepted that challenge, and the State Legislature provided financial support for construction of new buildings for the Island Laboratory. Beginning in the autumn of 1930, President George W. Rightmire, who was determined to develop the Laboratory, personally began searching for a full-time, year-round Director. In the first phase, six individuals were reviewed, but none were acceptable. Rightmire then followed the June 1933 recommendation of a University Faculty Committee which asked him to form an Advisory Committee comprised of distinguished alumni on faculties of other Universities. That

Committee of four, but not all alumni, and Julius F. Stone, ex officio, after meeting twice in 1934 urged the development of a large comprehensive agenda imbibed in the phrase, "Biology and Human welfare," including the hiring of a director. By December 1355, nine names had been recommended including Rightmire's own choice of Professor Dwight M. DeLong of the OSU Department of Zoology and Entomology. DeLong wrote Rightmire asking not to be appointed. The letter was not delivered to the President's office until 15 June 1936, the same day as the Board of Trustees met, however Rightmire may not have seen DeLong's letter. If he did see it prior to the Trustee's meeting, he chose to ignore it, for at that meeting, DeLong was appointed the first full-time, year-round Laboratory Director, effective 1 October 1936.

TERRESTRIAL ECOLOGY
2:15PM SATURDAY, MAY 4, 1996
TIMKEN SCIENCE HALL 240
BRIAN C. MCCARTHY - PRESIDING

2:15 AN ASSESSMENT OF THE ALLELOPATHIC POTENTIAL OF GARLIC MUSTARD (*ALLIARIA PETIOLATA; BRASSICACEAE*). BRIAN C. MCCARTHY AND SHERYL L. HANSON, DEPT. OF ENVIRONMENTAL PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS OH 45701.

Garlic mustard is a non-indigenous plant that is aggressively invading woodlands throughout the eastern United States. Previous work has shown that the species is having a negative impact on the diversity of understory communities and is actively displacing native species. The purpose of our study we to evaluate the extent to which allelopathy might be involved in the success of this invasive species. While members of the Brassicaceae have frequently been cited as being potentially allelopathic, few studies have been able to clearly demonstrate this effect. A water extract of garlic mustard tissue was prepared following a dilution series of 0.l, 0.01, and 0.001%, in addition to a 0.0% control. Separate extracts were prepared from root and leaf tissue. These extracts were applied to seeds and seedlings of four target species: radish, winter rye, hairy vetch, and lettuce. While seed germination rates varied by species and concentration, germination after 5-7 days was generally unaffected by the garlic mustard extracts. Only radish seeds treated with the most concentrated root extract exhibited a significantly depressed germination relative to the water control. Likewise, seedling biomass was generally unaffected by treatment Only shoot biomass for rye was significantly depressed with the highest concentration of leaf extract. Our data provide little evidence that allelopathy is involved in the invasive success of this exotic species.

2:30 COMPETITIVE ABILITY OF AN EXOTIC BIENNIAL WEED (*ALLIARIA PETIOLATA; BRASSICACEAE*) IN RELATION TO THREE NATIVE PLANT SPECIES. J. FORREST MEEKINS AND BRIAN C. MCCARTHY, DEPT. OF ENV. AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS OH 45701.

Alliaria petiolata (garlic mustard; GM) is an exotic biennial weed which is currently invading forested areas throughout the northeastern United States. Previous studies have shown that this plant aggressively enters communities and displaces resident understory species. One possible mechanism which may enable GM to successfully invade these areas is interspecific competition. A multiple deWit replacement series was conducted in the greenhouse to assess the competitive ability of GM rosettes in relation to three native plant species: jewelweed (*Impatiens capensis*), boxelder (*Acer negundo*), and chestnut oak (*Quercus prinus*). Each species was grown in monoculture and in mixture with GM. Above ground biomass (yield), relative yield (RY), total relative yield, and aggressivity were determined. Jewelweed and boxelder experienced greater intraspecific competition than interspecific competition with GM (RY > 1.U); GM grown with these two species experienced more interspecific competition (RY < 1.0). Jewelweed and GM were approximately equal in aggressivity, while boxelder was more aggressive than GM. In contrast, chestnut oak experienced more interspecific competition when grown with GM (RY < 1.0), and was less aggressive. GM rosettes have a greater competitive ability and aggressivity than oak, suggesting that oak forest understories may be particularly vulnerable to GM invasion. Thus, this invasive exotic may have an adverse affect on oak establishment and regeneration.

2:45 AN ASSESSMENT OF UNDERSTORY LIGHT ENVIRONMENTS AMONG MATURE SECOND-GROWTH OAK-HICKORY FORESTS IN SOUTHERN OHIO USING HEMISPHERICAL PHOTOGRAPHY. S.A. ROBISON, E.K. SUTHERLAND AND B.C. MCCARTHY, DEPT. OF ENVIRONMENTAL AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS OH 45701.

The patterns of understory light environments in central Appalachian oak-hickory forests have not been well studied. The purpose of our study was to evaluate the structural status of forest canopies across representative sites on the Wayne National Forest in southern Ohio. Hemispherical fisheye photography was used to record overstory cover on twenty-seven 0.125-ha plots at each of four sites (108 plots totals). Images were digitized and then analyzed with the GLI/C canopy assessment software. Measurements included percentages of open sky, direct beam radiation, diffuse radiation, and global radiation. No significant differences were detected among the four sites for any of the four light transmission variables. Min/max ranges were 1.1-10.1% for open sky, 0.7-30.8% for direct beam radiation, 1.2-15.3% for diffuse radiation and 1.1-23.0% for global radiation. Light transmission data were regressed against a previously determined integrated moisture index value for each plot. Generally, relationships were weak and of little predictive value (low R^2), with the possible exception of percent open sky ($P=0.035$, $R^2=0.04$). Our data suggest that a fairly heterogeneous canopy exits in these forests, resulting in low-to-moderate light environments which are not easily related to understory moisture conditions.

3:00 PATTERNS OF HARDWOOD MORTALITY IN A SOUTHEASTERN OHIO OAK-HICKORY FOREST. GRETCHEN M. WALTERS AND BRIAN C. MCCARTHY, DEPT. OF ENVIRONMENTAL AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS OH 45701.

The reporting of forest decline has increased dramatically in recent years. Many forests throughout the central Appalachians have been observed to be in declining health. The purpose of our study was to evaluate the health of a southeastern Ohio oak-hickory forest. Thirty-two 0.1 ha plots were established throughout the 550 ha Waterloo Wildlife Experiment Station (ODNR) in Athens County, Ohio. Data were collected for all living and dead stems with a dbh >/- 10 cm. For living trees, a decline index (DI) was determined to evaluate the percentage of branch dieback, undersized leaves, and chlorosis. Dead trees were also identified and categorized by mode of mortality (log vs. snag). Among the live trees, only two species (*Sassafras albidum* and *Juglans nigra*) exhibited non-healthy DI values. All other species were observed to be healthy or exhibiting only trace symptoms of decline. In contrast to decline, mortality patterns were markedly different among species. Mortality was highest for *Carya* spp. (38%) and *Quercus* (17%). There was no clear evidence of geographical clustering among stands based on mortality patterns. Our data suggest that persistent symptoms of decline are not evident; rather, mortality is likely the result of episodic inciting factors.

3:15 VARIATION IN ACORN PRODUCTION AND CHEMISTRY OF TWO OAK SPECIES (*QUERCUS PRINUS* AND *Q. VELUTINA*) WITH RESPECT TO TOPOGRAPHY. J.L. REED AND B.C. MCCARTHY, DEPT. OF ENV. AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS OH 45701.

Site quality has been shown to affect various aspects of resource allocation in plants. In particular, long-lived woody plants will establish a trade-off between reproductive effort, growth, and defense. The extent to which a tree balances reproductive effort against the production of carbon-based defensive compounds (e.g., tannins) is not well understood. While, slope aspect (e.g., N vs. S) is well known to influence site quality, the extent to which it ultimately affects seed production and tannin content has not been well studied. Thus, for two species of oak (*Q. velutina* and *Q. prinus*), we examined acorn production, patterns of predation, and tannin content of 36 trees on north- and south-facing slopes at the Waterloo Wildlife Research Station, Athens County, Ohio. *Quercus velutina* acorns suffered >50% mortality by acorn weevils (*Cucurlio conotrachealus*) whereas, *Q. prinus* suffered <20%. *Q velutina* trees growing on south-facing slopes experienced greater predation than those on north-facing slopes. In contrast, slope aspect did not influence *Q. prinus* predation rates. Further, *Q. velutina* acorn tannin content was significantly greater on south-facing Slopes compared to north-facing slopes; however, *Q prinus* did not show a discernible pattern. Site quality, as indicated by slope aspect, appears to significantly influence the reproduction and defense of certain oak species but not others.

3:30 COMPETITIVE EFFECTS OF *LONICERA MAACKII* ON NATIVE TREE SEEDLINGS. DONALD E. TRISEL AND DAVID L. GORCHOV, DEPARTMENT OF BIOLOGY, FAIRMONT STATE COLLEGE, FAIRMONT WV 26554. DEPARTMENT OF BOTANY, MIAMI UNIVERSITY, OXFORD OH 45056.

Lonicera maackii (Rupr.) Maxim., native to eastern Asia, was introduced to North America ca. 1920 as an ornamental plant. Non-cultivated shrubs of *L. maackii* now occur in Ontario and at least 23 states of the eastern US, growing at densities of up to 6800 shrubs/ha in secondary forests. Because there is a reduced herb layer under dense stands of this shrub, *L. maackii* may

be disrupting the natural succession of forests and old fields through allelopathy and/or competition. Field experiments were conducted to examine the effect of *L. maackii* shoot pruning and root trenching on the native tree seedlings. Pruning the shoot of *L. maackii* significantly increased the survival of Acer saccharum (Chi-square p=.02) and Fraxinusamericana (p=.03). Trenching the roots of *L. maackii* did not significantly affect survival of any of the species. Trenching and pruning combined further increased survival over shoot pruning alone in A. saccharum (p=.001). Competition for light appears to be the most important effect of *L. maackii* on tree seedling survival. Root competition becomes important to seedling survival when light is not limiting.

CROP PLANTS: PHYSIOLOGY AND HUMAN INTERACTIONS
9:00AM SATURDAY, MAY 4, 1996
TIMKEN SCIENCE HALL 221
ROBERT H. CICHEWICZ - PRESIDING

9:00 THE EFFECTS OF BIOINTESIVE CULTIVATION METHODS ON THE YIELD OF GREEN BEANS (*PHASEOLUS VULGARIS*) AND RED BEETS (*BETA VULGARIS*) GROWN IN SOUTHEASTERN OHIO DURING 1994 AND 1995. BEN F. HOLT AND MEGHAN K. BLAKE, DEPARTMENT OF ENVIRONMENTAL AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS OH 45701.

This study examined the responses of *Phaseolus vulgaris* and *Beta vulgaris* to one aspect of biointensive cultivation. The biointensive method of crop production emphasizes a number of unique cultural practices but we sought only to isolate the contribution of double digging (loosening the planting bed to ≈60 cm deep) to crop productivity and nutrient uptake. Comparison beds were prepared with the soil cultivated to ≈30 cm (single dug) and ≈5 cm (surface dug). During the 1994 season (beans only) there were 10 replicate beds measuring 1.5 m^2 for each cultivation type. During the 1995 season there were 5 replicate beds for each cultivation type for both beans and beets. Although there were significant differences (1994 beans) between the surface dug beds and other cultivation types for leaf biomass and chlorophyll content, there were no significant differences in the biomass of beans (whole fruit) produced. There were no significant differences in beet green or root (edible portion) biomass between the different cultivation types. Levels of Ca, Mg, and K in the bean fruits and beet roots were not significantly different between cultivation types. This study demonstrated that deep cultivation significantly alters the soil profile as measured by penetrometer resistance, but that this change does not necessarily alter bean/beet productivity or nutrient uptake.

9:15 THE EFFECT OF INCUBATION TEMPERATURE ON THE SENSITIVITY OF NORMAL AND TEXAS MALE STERILE CYTOPLASM MAIZE LEAVES TO *BIPOLARIS MAYDIS* RACE T TOXIN. J. D. BELTRAN AND M. O. GARRAWAY, DEPT. OF PLANT PATHOLOGY, THE OHIO STATE UNIVERSITY, COLUMBUS OH 43210.

To evaluate the effect of temperature on maize leaf responses to *Bipolaris maydis* race T (BMT) toxin detached leaves of Normal (N) and Texas male sterile (Tms) cytoplasm isolines (cv. B37 and OH43) were infiltrated with various concentrations of (BMT) toxin for 24 hr at 28 C in the dark, then cut into 4 cm segments. One set of segments from the toxin-infiltrated leaves were immersed in a DW bathing solution at 18 C in the dark and another set of comparable segments were incubated at 28 C in the dark. Electrolyte leakage (μmhos/mg dry wt./24 hr) from the two sets of segments was measured and compared. The toxin-treated Tms isolines leaked up to 8X more electrolytes at 28 C than at 18 C. In contrast, toxin-treated N isolines, or Tms isolines that were not treated with toxin, leaked 1.0X to 2.0X more electrolytes at 28 C than at 18 C. In the presence of light or with the addition of a malate+aspartate mixture to the DW bathing solution, there was little or no increase in electrolyte leakage from toxin-treated Tms segments accompanying an increase in temperature. Neither light nor the C-4 metabolites affected the potency of the BMT toxin. Also, the high sensitivity of Tms isolines to BMT toxin, observed in the dark, is known to be associated with the unique genetic characteristics of their mitochondria. Therefore, the increased sensitivity of toxin-treated Tms cytoplasm isolines to increases in temperature could also mean that Tms mitochondria are involved.

9:30 THE EFFECTS OF WOUNDING ON INDUCED GENE EXPRESSION OF *PHASEOLUS VULGARIS* ROOT NODULES. LORI L. SPARGROVE AND ARTHUR T. TRESE, DEPT. OF ENVIRONMENTAL AND PLANT BIOLOGY, 317 PORTER HALL, OHIO UNIVERSITY, ATHENS OH 45701.

It has been noted in the literature that plants respond to the stress of mechanical wounding by increasing the transcription of various genes. These genes include hydroxy-proline-rich glycoprotein (HRGP), phenylalanine-ammonia-lyase (PAL), chalcone synthase (CHS), β-1,3 glucanase, and chitinase. Previous studies have shown induced expression of these genes in hypocotyl, root, and leaf tissues following wounding. We have investigated the expression of the same set of genes after inflicting two kinds of wounds on bean root nodules. Our results show that nodules are capable of inducing a defense response characteristic of other plant tissues, and that different wounding styles result in different levels of gene expression. Furthermore, these nodules are capable of maintaining their intimate symbiosis with rhizobia, i.e. nitrogen fixation, despite the induction of these defense related genes.

9:45 THE EFFECTS OF WOUNDING ON *PHASEOLUS VULGARIS* ROOT NODULE DEVELOPMENT AND NITROGEN FIXATION. LORI L. SPARGROVE AND ARTHUR T. TRESE, DEPT. OF ENVIRONMENTAL AND PLANT BIOLOGY, 317 PORTER HALL, OHIO UNIVERSITY, ATHENS OH 45701.

In the development of the unique structure and function of nodules, specific plant genes, referred to as nodulins, are induced It has been reported in the literature that the early nodulin ENOD2 is found in all nodules thus far examined and is exclusively expressed in the inner cortex of the nodule, including the tightly packed cells of the boundary layer. It has been hypothesized by van de Weil *et al* (1990) that ENOD2 may play a role in the characteristic morphology of the inner cortex and the function of this tissue as a barrier for oxygen diffusion into the root nodules. We have performed wounding experiments in which the shoulder of an intact nodule, including the cortex, was removed with a razor blade. Acetylene reduction assays show that nodules can recover from a breach in the boundary layer and continue fixing nitrogen one week after wounding. To investigate whether ENOD2 is involved in the re-establishment of the oxygen diffusion barrier, we performed *in situ* hybridization's and looked for ENOD2 expression in the nodule wound layer. Our results show that ENOD2 is not expressed in the protective layer which develops after wounding, indicating that this barrier to oxygen diffusion develops independent of ENOD2 expression.

10:15 FOOD THAT HEALS: THE ANTI- β -HEMOLYTIC ACTIVITY OF CHILE PEPPERS (*CAPSICUM* SPECIES) AND THEIR APPLICATION IN MAYAN FOOD AND MEDICINE. ROBERT H. CICHEWICZ, DEPARTMENT OF ENVIRONMENTAL AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS OH 45701.

Chile peppers (*Capsicum* species, Solanaceae) are incorporated into the food, drink, and medicine of Mesoamerica's Mayan inhabitants. Capsicum species contain a number of biologically active compounds which convey both dietary and medicinal benefits to the Mayan people. Capsaicin (8-methyl-N-vanillyl-6-nonenamide), one of the pungent capsaicinoid compounds found in Chile peppers, is currently utilized for its analgesic qualities. Other chemical components found in chilies have been demonstrated as having potential anticancer and antimicrobial effects. The anti-hemolytic properties of aqueous extracts from ten varieties of five *Capsicum* species (*Capsicum annuum, Capsicum baccatum, Capsicum chinense, Capsicum frutescens,* and *Capsicum pubescens*) were tested with a hemolytic strain of *Streptococcus pyogenes* (ATCC 19615) grown on nutrient agar plates with 5% sheep blood. Plates were inoculated with overnight cultures of *S. pyogenes* and filter disks soaked in Capsicum extract were placed on the plate surface. After forty-eight hours the plates were examined for signs of ,β-hemolytic activity. All of the test extracts were found to inhibit the lysis of sheep erythrocytes. The anti-β-hemolytic activity of *Capsicum* species, in addition to the other medicinal and nutritional qualities of Chile peppers, may have an important impact upon the treatment and prevention of disease in Mayan society.

10:30 FITNESS OF WILD-CROP HYBRIDS OF *CUCURBITA PEPO* AND *HELIANTHUS ANGUS*. LAWRENCE J SPENCER, ALLISON A. SNOW AND PEDRO MORAN-PALMA, DEPARTMENT OF PLANT BIOLOGY, OHIO STATE UNIVERSITY, COLUMBUS OH 43210.

One possible problem with the use of genetically engineered cultivars in agriculture is the uncontrolled spread of transgenes outside of cultivar populations. We are investigating this problem in *Cucurbita pepo* (squash) and *Helianthus annuus* (sunflowers), both of which have wild and cultivar varieties which easily interbreed. Since the wild crop hybrids are fully viable, the main

goal of our research is to determine whether crop genes are likely to persist in wild populations. To investigate this question, we crossed squash and sunflower cultivars with wild conspecific plants. For sunflowers, we crossed two cultivar varieties with wild sunflowers from three geographic regions (Texas, North Dakota and Kansas). In the Kansas group only, cultivar pollen resulted in larger seeds than did wild pollen. Based on early growth of seedlings from the above crosses, hybrid progeny appear to be slightly larger than nonhybrids. In the case of squash, we crossed a disease-resistant transgenic variety and a similar non-transgenic variety with wild quash from Arkansas and Mississippi populations. Using a transgenic variety offers a unique opportunity to directly examine the persistence of transgenes in the wild. Preliminary results show that fruit size does not differ between the hybrid and nonhybrid progeny. Further fitness measures are planned including looking at dormancy characteristics and the relative fitness of hybrid progeny of these crosses. Taken together, our preliminary data suggest that hybrids are successful enough to allow crop genes to persist in wild populations.

10:45 THE EFFECTS OF NITROGEN AND NITROGEN/PHOSPHORUS NUTRIENT ADDITIONS ON THE PLANT COMMUNITY COMPOSITION OF A 1ST-YEAR OLD-FIELD. **Heather M. McClure and Mary Benninger-Truax, Biology Department, Hiram College, Hiram OH 44234.**

Several parameters were examined in a 1st-year old-field plant community enriched with nitrogen and nitrogen/phosphorus fertilizers. Thirty 16 x 20 m plots were established in a recently-tilled former corn field during May, 1995. During the first year, six plots were treated with ammonium nitrate (N) fertilizer, six were treated with diammonium phosphate (N/P) fertilizer, and six were designated as controls. All treated plots received 300 kg/ha nitrogen; N/P plots also received 768 kg/ha phosphorus. Above-ground plant biomass and plant litter was sampled from 3 quadrants (0.25 m2) 3 times during the growing season from each plot. Plant samples were separated into standing dead and live biomass; live biomass was further separated by species. All samples were dried for 72 h at 80°C and weighed to the nearest 0.01 g. Analysis of variance tests of the first plant sample indicate that above-ground biomass was significantly greater in N/P plots than in N or control plots; the wild radish (*Raphanus raphanistrum*) accounts for most of the biomass differences among the plots. Species richness was significantly greater in control plots than N-treated plots, but no differences between the N-P-treated plots and the other plots were observed. Results from the later two samples and information pertaining to the below-ground biomass are currently being analyzed. This 1st-year study of plant community responses to nutrient additions will contribute to the long-term goal to study the effects of the type and timing of nutrient additions on an old-field ecosystem. Support for this undergraduate research project was provided by the Howard Hughes Medical Institute.

Plant Physiology
2:15PM Saturday, May 4, 1996
Timken Science Hall 221
Brent DeMars - Presiding

2:15 MYCORRHIZAL STATUS OF *DESCHAMPSIA ANTARCTICA* IN THE PALMER STATION AREA, ANTARCTICA. **B.G. DeMars and R.E.J. Boerner, Biology Department, Lakeland Community College, 7700 Clocktower Drive, Kirtland OH 44094.**

Vesicular arbuscular mycorrhizae (VAM) were absent in 75 individuals of *Deschampsia antarctica* (Antarctic hairgrass) collected from the Palmer Station area, Antarctica in 1993. The accompanying soil had no mycorrhizal infectivity based on inoculation trials with *Sorghum sudanense*. Individuals of *D. antarctica* were, however, capable of forming typical VAM infections when inoculated with either *Glomus intraradices* or *Glomus etunicatum* in the greenhouse. The lack of VAM and soil infectivity suggests that this mutualism is rare in Antarctica due to lack of inoculum sources.

2:30 EFFECT OF SALINITY AND TEMPERATURE ON THE GERMINATION OF *SUAEDA FRUTICOSA*. **M. Ajmal Khan and Irwin A. Ungar, Department of Environmental and Plant biology, Ohio University, Athens OH 45701-2979.**

The effect of salinity and temperature on the seed germination of *Suaeda fruticosa* (L.) Forssk. collected from a subtropical maritime desert habitat was studied. Cumulative germination percentages decreased with an increase in salinity. Seed germination occurred up to the 400 mM NaCl treatment. A temperature regime of 15-25 °C was more suitable for germination than the higher and lower thermoperiod. When ungerminated seeds were transferred to distilled water after 20 days of exposure to salinity, they germinated quickly. There was up to 80% recovery from the salinity treatments in the seeds initially treated with 500 mM NaCl. Seeds exposed to lower thermoperiods demonstrated a higher priming effect to salinity exposure than did the higher thermoperiod treatments.

2:45 BIOREMEDIATION OF BRINE CONTAMINATED SOILS BY SALT ACCUMULATING HALOPHYTES. **Carolyn H. Keiffer and Irwin A. Ungar, Department of Environmental and Plant Biology, Ohio University, Athens OH 45701.**

To determine the feasibility of using halophytes to remediate brine contaminated soils, seeds of *Atriplex prostrata, Salicornia europaea, Spergularia marina,* and *Suaeda calceoliformis* were planted on a former brine holding pit in March, 1994. The study site, located in Velma, OK, was completely unvegetated and previous reclamation attempts had failed. The chemical composition of the soil was determined prior to planting by obtaining three soil samples from each of the m^2 replicate and control plots (n=6). A slow release fertilizer was applied to half of the plots at the time of planting. All species, except *S. europaea*, had some germination within 30 d of planting. However, only *A. prostrata* plants survived until harvest. Plants were collected and analyzed in October, 1994 and soil samples were taken from the root zone of each plant and from a paired control plot. Edaphic conditions varied greatly between plots and sodium levels were significantly reduced in five of the six plots when compared to the controls. Total dry weight biomass of *A. prostrata* ranged from 3.6 - 193.4 $g \cdot m^{-2}$ and was directly correlated with the amount of sodium accumulated by the plant. Fertilizer amendments were determined to have no direct effect on biomass production. Soil and vegetation analysis in March and October of 1995 indicated 100% cover by native plants in the lower salinity area and well established *A. prostrata* plants in the higher salinity area. Sodium content of the soil was reduced by an average of 65% over the course of the two year study when compared to soil salinity in 1994.

3:00 CYTOLOGICAL CHANGES IN NEEDLES OF ECTOMYCORRHIZAL AND NONMYCORRHIZAL PITCH PINE SEEDLINGS EXPOSED TO ALUMINUM AT TWO NUTRIENT LEVELS. **Carolyn J. McQuattie, USDA Forest Service, 359 Main Rd., Delaware OH 43015.**

Cellular symptoms of aluminum toxicity in needles of pitch pine (Pinus rigida) may vary depending on the mycorrhizal status of the seedling or nutrient level in the irrigation solution. Four-week-old pitch pine seedlings growing in sand culture were inoculated either with a broth slurry of the fungus *Pisolithus tinctorius* or with sterile broth and were exposed to Al (0, 10 or 20 mg/L) in nutrient solution containing either a low or high level of nutrients. After 66 days, needles from each treatment were chemically fixed and resin-embedded for transmission electron microscopy. Additional needles from the low nutrient level were frozen in liquid propane, freeze-substituted in chromium trioxide and resin-embedded for examination by x-ray microanalysis (EDS). At 10 mg/L Al mesophyll disruption (chloroplast and cytoplasm deterioration) in needles of mycorrhizol (M) and nonmycorrhizal (NM) seedlings was greater at the low nutrient level. At 20 mg/L Al, increased chlorosis and greater chloroplast deterioration were seen in needles from NM seedlings compared to M seedlings at both nutrient levels. Starch grains in chloroplasts, seen only at the low nutrient level, were significantly larger in needles of NM seedlings. Al was detected by EDS in the xylem, endodermis, and plasmolyzed mesophyll cells in needles from NM seedling but only in xylem cells in needles from M seedlings.

3:15 GENOTYPIC VARIATION FOR CONDENSED TANNIN PRODUCTION IN TREMBLING ASPEN (*POPULUS TREMULOIDES*) UNDER ELEVATED CO_2 AND IN HIGH AND LOW FERTILITY SOILS. **Jennifer L. Mansfield and Peter S. Curtis, Dept. of Plant Biology, 1735 Neil Ave., Ohio State University, Columbus OH 43210.**

The Carbon/Nutrient Balance Hypothesis suggests that leaf C:N ratios influence the synthesis of secondary compounds such as condensed tannins. Plants grown under elevated CO_2 and low fertility often have higher C:N ratios and should therefore increase production of carbon-based secondary compounds. Six genotypes of *Populus tremuloides* were grown under elevated and ambient CO_2 partial pressure and high and low fertility in field open-top chambers at the University of Michigan Biological Station. During the second year of exposure, leaves were harvested 3 times (June, August, and Septem-

ber) and analyzed for condensed tannin production using the Radial Diffusion Assay. Preliminary analysis indicates significant genotype, fertility, and CO_2 effects, but no significant interactions among these terms. For each genotype, plants grown in high CO_2 (700 ppm) and low fertility had significantly higher tannin production compared plants grown under ambient CO_2 (350 ppm) and high fertility. Our results support the Carbon/Nutrient Balance Hypothesis and suggest that rising levels of CO_2 in the atmosphere may alter plant secondary compound production.

3:30 THE EFFECT OF ATMOSPHERIC CO_2 AND SOIL NITROGEN ON THE PHOTOSYNTHETIC LIGHT RESPONSE OF TREMBLING ASPEN (*POPULUS TREMULOIDES*). **Xianzhong Wang, and Peter S. Curtis, Dept. of Plant Biology, 1735 Neil Ave., Ohio State University, Columbus OH 43210.**

Photosynthetic light response curves of plants can be used to elucidate environmental effects on leaf dark respiration, quantum yield, light compensation point and the maximum CO_2 assimilation rate. We studied the photosynthetic light response characteristics of trembling aspen saplings grown in open-top chambers at the University of Michigan Biological Station in northern lower Michigan. The trees were grown under four treatments: ambient (350 ppm) and elevated (700 ppm) CO_2 and low and high soil N availability. Each treatment was replicated five times. Major results included; I) elevated CO_2 grown plants had significantly higher dark respiration than those grown at ambient CO_2, but soil N availability had no significant effect on dark respiration; 2) Quantum yield of elevated CO_2 grown plants was significantly higher than that of ambient CO_2 grown plants, but it was not affected by soil N levels; 3) Neither CO_2 concentration nor soil N availability had a significant effect on the light compensation point; 4) Both CO_2 concentration and soil N availability had significant effects on light saturated net assimilation rates. Since CO_2 effects on dark respiration and quantum yield were independent of soil N availability, a shift in leaf-level physiology is expected under future, high CO_2 conditions even when soil fertility limits plant growth.

3:45 EVALUATION OF THE INHIBITION OF BACTERIAL GROWTH BY SELECTED HERBS. **R.L. Loy and K.R. Finer, Dept. of Biological Sciences, Kent State University/Stark Campus. 6000 Frank Ave. N.W., Canton OH 44720.**

Many folk and homeopathic remedies are based on the natural antibacterial activities of certain plants. The objective of this study was to investigate the anti-microbial effectiveness of some of these plants. The samples used were chosen on the basis of their purported antimicrobial activity. Three extracts were prepared from each sample. Active compounds were extracted using ethanol, water, and steam. One-hundred microliters of prepared sterilized extract was loaded into shallow assay wells that had been cut into Mueller Hinton agar plates seeded with either *Pseudomonas aeruginosa, Staphylococcus aureus, Salmonella typhimurium,* or *Enterococcus feacalis.* In addition, each plate contained both a positive and negative control. Plates were incubated in an upright position for 24-48 hours. After that time bacterial growth surrounding the wells was examined. Extract activity was ranked on a scale of 0-4 with 0 indicating no inhibition and four indicating a very active compound. Of eleven herbal preparations tested, six have demonstrated antimicrobial activity. Two of those compounds have shown activity greater than 2 on the scale. These preliminary results suggest some validation for the claims of certain herbal preparations.

Earth and Space Science Division
Earth and Space Science - Geography
9:15AM Saturday, May 4, 1996
Timken Science Hall 180
Thomas Schmidlin - Presiding

9:15 SEVERE WEATHER AND THE AUTOMOBILE. **Thomas W. Schmidlin, Department of Geography, Kent State University, Kent OH 44242.**

Americans spend much of their lives in motor vehicles. Government safety recommendations give procedures to follow when caught in a vehicle during severe weather. This ranges from staying in the vehicle (blizzard, lightning) to quick evacuation out of the vehicle (flood, tornado). This reassessment of the safety of vehicles as shelter is made relative to the type of hazard, immediacy of the hazard, likelihood of multiple hazards, population at risk, and other available options for shelter to the motorist. Safety rules and research are needed to clarify risks to vehicle occupants during severe weather.

9:30 NORTHERN HEMISPHERE PRECIPITATION AND TEMPERATURE ANOMALIES ASSOCIATED WITH THE 1908 TUNGUSKA METEORITE. **John J. Moore, Department of Geography, California State University at Northridge, Northridge CA 91328; and Kenneth A. LaSota, Department of Natural Sciences, Robert Morris College, Pittsburgh PA 15219.**

On June 30, 1908, as much as 30 million metric tons of NOx were injected into the atmosphere when the massive Tunguska meteorite exploded over Siberia. Barometric and seismic stations the world over recorded the event. Within two weeks of the impact, the Smithsonian Astrophysical Observatory measured a 45% reduction in atmospheric ozone in the northern hemisphere. In this study, records from 217 weather stations located above 30 degrees north latitude were reviewed for precipitation and/or temperature anomalies for the years 1908 to 1911. This three year interval is in keeping with the duration of global climate anomalies associated with other singular atmospheric perturbations, such as volcanic eruptions. Anomalies were considered to be years in which a station's yearly precipitation or mean annual temperature exceeded by two standard deviations the station's historical mean. Review of the 217 stations' records from the National Climate Data Center's Meteorological Archives (CD ROM World Weather Disc) revealed 36 northern hemisphere precipitation anomalies and 30 temperature anomalies. These anomalies were confined mainly to tropospheric frontal boundaries located in the western United States, the Mediterranean and Eastern Asia.

9:45 LAND OWNERSHIP AND PARCEL SIZE AS ANTECEDENTS TO LAKE HOPE STATE PARK. **L.M. DeChano, Dept. of Geography, Clippinger Lab, Ohio University, Athens OH 45701.**

Lake Hope State Park is nestled in Zaleski State Forest, Vinton County, Ohio. Land ownership played a major role in the park's evolution. Three phases of land ownership are investigated: the Ohio Company of Associates lands, iron furnace lands, and governmental lands. The Ohio Company owned land in southeastern Ohio that was sold to individuals. Some land repaid Revolutionaries for their service during the war, thus essentially dividing the area into relatively small parcels. The iron industry, beginning in 1854 at Hope Furnace, reassembled some of these smaller parcels into larger lots. Large tracts of land allowed the iron industry to prosper for twenty years, supplying timber for fuel and essential minerals for iron production. In 1870 Douglas Putnam bought the failing iron furnace and acquired contiguous parcels of land from smaller land owners to aid in paying their debts. Following the "heyday" of the iron industry, heirs and stockholders sold their land to the federal government due to bleak prospects of more minerals. Furnace land holders perceived the land as worthless, thus, willing to sell. Large land holdings allowed for easier establishment of Lake Hope State Park. Lake Hope was built as a flood protection measure in the Raccoon Creek watershed. This reservoir complied with the initiative of building reservoirs as protection from flooding in the Ohio River Valley. Therefore, the nature of parcel size and ownership influenced the spatial evolution of Lake Hope State Park.

10:00 THE 1794 BATTLE OF FALLEN TIMBERS: TWO CENTURIES OLD AND NOT OVER YET! **Jeffrey J. Gordon, Department of Geography, Bowling Green State University, Bowling Green OH 43403.**

The Battle of Fallen Timbers, won against the Ohio tribes on Aug. 20, 1794, supposedly occurred on the Maumee River floodplain near present-day Toledo. This decisive military action broke Indian resistance in the newly acquired Northwest Territory, resulting in the Treaty of Greenville which opened a vast hinterland for white settlement. When 816 acres, near the Fallen Timbers historic landmark commemorating this pivotal event were rezoned in February 1995, their possible significance in the battle was raised. A site survey of 167 acres was commissioned to determine the exact battle area. In June, 1995, archeologist Dr. G. Michael Pratt, and volunteers, discovered over 300 battlefield artifacts nearly one mile northeast of the designated site. Now, two centuries later, there is a battle over the battlefield. Geographical problems of an economic, social, and political nature include: 1. Developers have options on this land for commercial and residential use. 2. Preservationists would like to save the real battlefield. 3. If the site is preserved, development of the remaining land is affected. 4. Zoning of this land is controlled by the city of Maumee but the city of Toledo owns it. 5. A culturally sensitive approach to American Indian concerns must be included in all decision-making. 6. Questions abound concerning the preservation, safeguarding, disposition and eventual locational display of the artifacts.

10:15 A COMPARISON OF SPATIAL DATA INTERPOLATION METHODS. **Yu Zhou, Department of Geography, Bowling Green State University, Bowling Green OH 43403.**

Spatial data are often collected in a point-sampling fashion. Values for locations without observations, therefore, have to be estimated from measured point samples. A specific method to accomplish this task is by means of interpolation. In the interpolation process, a numerical procedure generates an estimate of functional dependence at a particular location, based upon knowledge of the functional dependence at some surrounding locations. This technique assumes that the phenomenon being predicted is closely approximated by the mathematical function; the unknown values are then calculated according to this function. Since mathematical functions for spatial data are usually nonanalytical and seldom known, an optical interpolation is hard to achieve. As a result, many interpolation methods, with different mathematical functions exist. The quality of the interpolation results. therefore, depends on the accuracy, number and distribution of those sampled points as well as the methods selected. In this study, the effects of interpolation methods (including inverse distance, kriging, minimum curvature, radial basis function, Shepard's method, and triangulation) on quality of isoline maps will be compared. Ohio's climate data is used in this study for comparison.

2:15 Division Business Meeting in Timken Science Hall 180

2:45 Poster Break

Earth and Space Science - Hydrogeology

3:15PM Saturday, May 4, 1996

Timken Science Hall 180

Julie Weatherington-Rice - Presiding

3:15 AN ANALYSIS OF STREAM CHANNEL MORPHOLOGY AND FLOOD PLAIN BEDROCK ELECTROMAGNETIC TERRAIN CONDUCTIVITY. **J. Richard Jones, Department of Geology, Acadia University, Wolfville, Nova Scotia, BOP 1X0, Canada and Kenneth A. LaSota, Department of Natural Sciences, Robert Morris College, Pittsburgh PA 15219.**

Electromagnetic terrain conductivity data can reveal variations within the permeability of subsurface rock units. This study tests how well such subsurface variations are reflected in an associated stream channel. A Geonics EM31 electromagnetic conductivity instrument was used to measure the conductivity at 10 m intervals along a 1,080 m transect established 10 m above the bank of Mingo Creek, located about 65 km southwest of Pittsburgh, PA. Conductivity measurements were recorded at three and six meter depths for Pennsylvanian age strata consisting of shales, sandstones and limestones. The recorded conductivity measurements are within the range of other sandstone, shale and limestone lithologies. The spatial correspondence between high and low conductivity measurements along the flood plain transects with associated stream channel features is excellent High conductivity of the strata beneath the flood plain is associated with channel pools, and low conductivity with bedrock outcroppings or riffles within the channel. Spatial variations in the conductivity spectra reveals an apparent conductivity shift that follows the regional northeast-southwest structural trend.

3:30 DEVELOPMENT OF NEW PUBLIC WATER SUPPLY WELLFIELDS USING ELECTROMAGNETIC CONDUCTANCE: TWO CASE STUDIES, WESTERN AND CENTRAL OHIO. **Richard Cowles, and Ernest Williams, Bennett & Williams, 2700 E. Dublin Granville Rd., Columbus OH 43231.**

EM surveys, combined with geologic/hydrogcologic information, provide quick, inexpensive tool for maximizing potential wellfield sites. EM surveys using an EM34-3 instrument were conducted for two separate water suppliers in western and central Ohio. In both studies, buried valley aquifer systems with glacially-derived sediments, were examined for new water supply wells. Case Study I. A region of east-central Ohio, experiencing rapid population and development growth, needs water supply to serve new demands. Several traditional investigations using exploration borings and located well logs have failed to find an adequate supply. An EM survey identified 60 acres with potential for wellfield development. Following a 48-hour pumping test, it was determined that this site would produce approximately 1.5 million gallons per day. Case Study II. City on Great Miami River, needs to expand current wellfield to supply adjacent communities and comply with OEPA requirements. Two test borings on City owned land failed due to shallow rock and silt/clay deposits. Initial findings reduced site by 1/3, EM survey was conducted to optimize positioning of wells on remaining site. Survey found adequate area with aquifer material, also found large plume from up gradient lagoon. Discovery avoided costly mistake of installing new wells in ultimately abandoned area. Instead, city implemented alternative well field management practices, upgraded construction of existing wells, and created wellhead protection.

3:45 USING WATER RESOURCES FOR IRRIGATION IN SEMIARID LAND: A VIEW FROM THE REPUBLIC OF YEMEN. **Abdulla M. Ahmed, 1130 Morris Rd # 3. Kent OH 44240.**

The Southwest of Arabian Peninsula (Yemen) is one of the most extensively terraced areas in the world. Terraces have a soil conserving as well as a water--collecting function Rainfall is the main source of both surface and ground water. The annual rainfali varies from 20mm in the coastal areas to 1000mm/yr. in the interior mountainous areas. Since the amount of rainfall is not always sufficient, development of a system for irrigation was necessary for successful crop production. The agriculture in the mountain areas mostly dry land farming, while in the low land, agriculture depends on floods and ground water. Thus, the terrace system and types of irrigation systems characterize Yemeni agriculture. These systems were developed over thousands of years and require continuous maintenance. The fame of the "Arabia Felix" of ancient times is based particularly upon the variety of its agricultural products. However, in recent years, socio-economic changes have affected the traditional system of agriculture by virtue of which Yemen had lived in harmony with the ecosystem over centuries. Some of these effects on environment are positive and others are negative in relation to irrigation and land use for agricultural purposes.

4:00 DRAINAGE BASIN DELINEATION OF THE WARRENSBURG ROAD KARST, DELAWARE COUNTY, OHIO: IMPLICATIONS FOR EVALUATING LAND USE IMPACTS. **T. Joseph Dogwiler[1], John B. Ritter[1], and Horton H. Hobbs[2] III, Departments of Geology[1] and Biology[2], Wittenberg University, P.O. Box 720, Springfield OH 45501-0720.**

The Warrensburg Road Karst, underlain by the Columbus Limestone and located east of the Scioto River in southwestern Delaware County, Ohio is characterized by numerous insurgent sinkholes, subterranean drainage conduits, and a resurgent spring. The hydrology and sedimentology of the resurgent Dewitt Spring have been studied to create a framework within which future analysis can be performed and land use impacts within the area evaluated. Surface drainage consists of short (<0.25 km), first-order, ephemeral streams that flow into the subsurface via sinkholes. Five sinkhole insurgences have been connected positively with Dewitt Spring using Fluorescein dye tracing. The resurgence has multiple overflow points successively increasing elevations that function during high discharge events. Based upon surface topography, the sinkholes, resurgence, and surface streams are situated within an approximately 1 km^2 drainage basin. Soil erosion in the Warrensburg Road Karst is significant. Suspended sediment loads of between 0.25 and 1.04 g/l have been measured at the insurgences and correlated to individual storm events. This sediment is derived in a large part from channel scour (ranging from 2-5 cm per storm event) upstream of the insurgences. Decreased sediment concentration and lack of fine sediment deposition at the resurgence suggests that sediment is being stored, at least temporarily, in the subsurface.

4:15 FRACTURE FLOW IN HIGH CLAY CONTENT GLACIAL MATERIALS - APPLYING THE FRACTRAN MODEL. **Julie P. Weatherington-Rice, Bennett & Williams Environmental Consultants Inc., 2700 E. Dublin-Granville Rd., Suite 400, Columbus OH 43231.**

Ongoing research in Ohio has established that fracture formation and depth are functions of clay mineralogy and historic low water tables. Illite clays control fracture formation, desiccate rapidly and do not rehydrate to reheal. Observations indicate that fractures form in a short time and persist, creating dominant routes of water and contaminant transport. FRACTRAN, Sudicky and McLaren, Waterloo Centre for Groundwater, is the first model designed to address this hydrogeologic setting. The model was applied to the Clarkco Landfill Site, Clark Co., Oh. Previous investigations by Antioch College and ODNR have established the presence of fractures near the facility. The elevation and site of the facility suggests historic dewatering during Holocene or before. Computations based on traditional sampling method results and equations indicated that the time-of-travel through 30 feet of till over a 100 gpm+ s&g aquifer was 170 years. FRACTRAN confirmed the 170 years for saturation

of the till but showed breakthrough in 12.5 years with random fractures 0.25 mm in width. Runs made with Ohio EPA recommendations for hydraulic conductivity showed breakthrough in 7.5 years. The use of this model is not appropriate for every setting. Clay mineralogy identification and ratios, grain size analysis, and site pit investigations should be the determining factors for application. Where clay fractions are significant, illite ratios increase with depth, fractures become dominant pathways, FRACTRAN applies.

EARTH AND SPACE SCIENCE - GEOLOGY
9:00AM SATURDAY, MAY 4, 1996
TIMKEN SCIENCE HALL 160
MARK J. CAMP - PRESIDING

9:00 POSTON BRICK WORKS IN INDIANA AND ILLINOIS. MARK J. CAMP, DEPARTMENT OF GEOLOGY, UNIVERSITY OF TOLEDO, TOLEDO OH 43606.

The Poston Family of England first arrived in New England in the early 1700s. Some Postons' settled in the Hocking Valley of south central Ohio around the 1830s and became involved in many agricultural, industrial, and scientific developments of the region. Of interest to geologists are Irvin G. and Clarence E. Poston, born and raised amidst the coal and clay industry of Nelsonville, Ohio. Around 1892, Irvin moved to Veedersburg, Indiana where he established the Wabash Clay Company. Originally the firm used local fire clay, but then turned to local Pennsylvanian shales. Two different shales were combined to make Poston block, used for street paving. The brickworks, sold to the Culver Brothers in 1906, operated for many more successful years. Irvin built a second brick works in Crawfordsville around 1900, the Poston Paving Brick Co. Mississippian Borden Group shales were used here. Into the 1950s, the Crawfordsville plant was a major producer of various brick products. Clarence E. Poston moved from Logan Ohio to Crawfordsville in 1903 and returned to the brick business in 1907, constructing a brick works at Attica, Indiana. Mississippian shales were made into pavers originally, but production switched to face bricks around 1920. The plant remained within the Poston family until its sale in 1961. Irvin Poston moved to Martinsville, Indiana in 1907 and with one of his sons Edwin, opened the Martinsville Brick Company. Local Borden shales were used here until 1946 when the plant closed. In 1950 the plant reopened under management of another Poston company from Illinois. The Poston Brick Co. at Springfield, Illinois was established in 1916 by Emmett V. Poston and his father, Irvin. This plant evolved into the Poston Brick and Concrete Co. before closing in the early 1970s. The closing of the Thomas Moulding Brick Co. of Martinsville, Indiana in 1976 ended the Poston realm. Little evidence remains of these once important plants, but Poston blocks lie in many streets and buildings of midwestern communities.

9:15 JAMES A. GARFIELD (1831-1881): RADICAL REPUBLICAN LEGISLATOR, PRESIDENT, AND CHAMPION OF GOVERNMENT SPONSORED GEOLOGICAL INVESTIGATIONS. JOSEPH T. HANNIBAL, THE CLEVELAND MUSEUM OF NATURAL HISTORY, 1 WADE OVAL DRIVE, CLEVELAND OH 44106-1767.

James A. Garfield was a Radical Republican legislator and, for a short time before being assassinated, US President. During his legislative career he was an indefatigable and influential proponent of progressive causes, including government support of education, school libraries, and scientific research. As an Ohio State Senator, Garfield argued for the resumption of an Ohio geological survey. Later, as a United States Congressman, Garfield had an important role in the funding of various nineteenth century geological work in the western part of the country and played a key role in the establishment of the US Geological Survey. Garfield was an active attendee at scientific lectures and had cordial relations with several prominent scientists, including geologists Ferdinand Hayden (1829-1887) and John Wesley Powell (1834-1902). The Garfield Monument in Cleveland's Lake View Cemetery contains the remains of Garfield and his wife as well as Garfield's daughter and son-in-law, Joseph Stanley-Brown (1858-1941). Stanley-Brown served as a Secretary first to Powell and then to Garfield. He also published on geological topics.

9:30 GEOMETRY OF STABLE CAPTURE ZONES FOR PLANET EARTH: POTENTIAL FOR CALCULATION OF THE PROBABILITIES OF GRAVITATIONAL CAPTURE OF SATELLITES. ROBERT J. MALCUIT, DEPT. OF GEOLOGY AND GEOGRAPHY, RONALD R. WINTERS, DEPT. OF PHYSICS AND ASTRONOMY, DENISON UNIV., GRANVILLE OH 43023.

Mapping of two-dimensional parameter space in the region of the earth's orbit has led to the identification of two retrograde (clockwise motion) and two prograde (counterclockwise motion) zones for stable capture orientations. The parameters mapped are planet anomaly (position of the planet in degrees at the beginning of the encounter simulation) and orbital eccentricity of the planetoid (relative to a circular orbit for the planet). A stable capture zone can be defined as a region of this two dimensional parameter space in which the orbital orientation at the time of a close encounter (a putative capture encounter) is favorable for long-term, post-capture orbital stability. The major requirements for stable capture are; (1) sufficient energy dissipation by tidal action within the interacting bodies and (2) proper orientation of the orbit of the candidate planetoid at the time of the encounter. If we assume adequate energy dissipative properties for the interacting bodies, then the orientation of the encounter becomes critical. For stable prograde capture, the major axis of the orbit of the candidate planetoid must be within +/-5° of a line perpendicular to the tangent of the planet's orbit and for stable retrograde capture, the major axis of the planetoid's orbit must be within +/-5° or a line parallel to the tangent of the planet's orbit. These severe geometric constraints can be met over narrow bands (about 0.5%) of planetoid orbital eccentricity extending for several 10's of degrees of planet anomaly. An estimate of the probability of stable gravitational capture can be obtained by measuring the line intercept of stable capture zones for a given band of planetoid orbital eccentricity.

9:45 NEW BEDROCK GEOLOGY MAPS OF CENTRAL-WEST AND NORTHWEST OHIO. E. MAC SWINFORD, ODNR, DIVISION OF GEOLOGICAL SURVEY, 4383 FOUNTAIN SQ. DR., COLUMBUS OH 43224.

The Bedrock Geology Mapping Group at the Ohio Department of Natural Resources, Division of Geological Survey, supported by cooperative federal and state agencies, has remapped the bedrock geology of western Ohio on 7.5-minute quadrangles. A digital compilation of more than 200 of these maps for central-western and northwestern Ohio indicates a considerable change from the geology depicted on the current 1920 state bedrock map. The map compilation reflects a heavily dissected bedrock surface in western Ohio, in contrast to a relatively smooth bedrock surface in northwestern Ohio. The areal distribution of the bedrock is influenced by the structure of the regional basins and arches. The most prominent structural feature indicated by this new bedrock mapping is the north-south trending Bowling Green Fault, mapped from the Michigan-Ohio border southward to central Hancock County. Comparison of the area's bedrock geology with a basement structure map, a magnetic anomaly map, and an oil and gas fields map emphasizes the nose relationship between the surface geology, subsurface geology, and deep crustal geology of the region. The new open-file bedrock geology quadrangle maps provide an excellent data set that can assist planners in making land-use decisions and explorationists in developing and utilizing mineral resources, ground water, and fossil fuels.

10:15 A CASE HISTORY OF AN ABANDONED DEEP MINE. ANN G. HARRIS, DEPARTMENT OF GEOLOGY, YOUNGSTOWN STATE UNIVERSITY, 410 WICK AVENUE, YOUNGSTOWN OH 44555-0001.

On March 4, 1995, three vehicles were on the eastbound lane of Interstate 70 just east of Cambridge, Ohio, when suddenly an 8 foot section of the road collapsed and the first car fell into it. The second car could not stop and ran over the roof of the first car. The semi-truck stopped but its front wheels rested on the roof of the car. The woman in the first car had her foot crushed and eventually it was amputated. The reason for the collapse was the Murray Hill #2 coal mine that operated from 1912-1935. It was owned by the Akron Coal Company. The #7 or Upper Freeport coal which was 5-5 1/2 foot thick was mined. The average depth of the holes was 66 feet and part of the mine was filled with water. Almost 2,200 boreholes with 12 foot centers were drilled and each filled with an average of 18 yards of grout. While drilling the boreholes sometimes the adjacent borehole would eject water like a geyser higher than the mast of the drilling rig. The mine had been dewatered several times by strip mining which added to its instability. I-70 was finally reopened on August 16, 1995.

10:30 LATE-PLEISTOCENE VALLEY STRATIGRAPHY AND DRAINAGE HISTORY OF THE LICKING RIVER, OHIO. TOD A. FROLKING, DEPT OF GEOLOGY AND GEOGRAPHY, DENISON UNIVERSITY, GRANVILLE OH 43023.

Logs of oil/gas and water wells, when analyzed with caution, can provide a generalized valley-fill stratigraphy for the deep bedrock valleys of east-central Ohio. These data are combined with topographic features, soil patterns and shallow cores to map the distribution of diamict, outwash, lacustrine, and fluvial deposits within valleys of the Licking River drainage. The upper 30+ meters of valley fill in the North Fork, South Fork and Raccoon Creek

tributaries differ dramatically in ratios of coarse to fine textured sediment suggesting different glaciation/deglaciation histories. Surface topography and soil distributions generally conform with these subsurface differences. A controlling factor for valley drainage in late- and post-Illinoian time (post filling of the deep Newark River valley at Hanover) was the cutting of Black Hand Gorge which allowed free drainage to the east but provided a bedrock base level which limited channel incision upstream. A recently-discovered out washover varved (?) lacustrine silt and clay sequence near the head of the Gorge may provide a clear time line for its formation. Gorge cutting scenarios which link with interpretations of the regional glacial history and the diverse valley stratigraphies will be discussed.

10:45 PLEISTOCENE STRATIGRAPHY OF HARTFORD TOWNSHIP, LICKING COUNTY, OHIO. **John P. Szabo, Geology Department, University of Akron, Akron OH 44325-4101.**

Data from 21 borings, many of which were drilled in the southern half of Licking County, penetrated two Wisconsinan tills and three Illinoian tills. Late Wisconsinan deposits range from 2-10m thick, and each advance is represented by both subglacial and super glacial facies having similar textures and differing fine-carbonate contents (%<0.074 mm). Diffraction intensity ratios of the superglacial facies are larger than those of the subglacial facies because of the difference in hydraulic conductivities. Diamictons of the subglacial facies average 7% fine carbonate and have calcite/dolomite = 0 13 whereas those of the superglacial facies average 19% fine carbonate and have calcite/dolomite = 0.26. Up to 5 m of Millbrook Till underlie Wisconsinan deposits and overlie 5-26 m of Gahanna Till and associated glaciofluvial deposits representing multiple ice advances. Chesterville Till underlies Gahanna Till and has a maximum thickness of 21 m beneath the Johnstown Moraine in the south-central part of the township. Textures and diffraction intensity ratios differ slightly among the Illinoian tills. The fine-carbonate content of the Millbrook Till is 6%, that of the underlying Gahanna Till is 14%, and that of the Chesterville Till is 9%. Glacial deposits of Hartford Township represent static ice front positions during both the Illinoian and Wisconsinan glaciations.

2:15 Division Business Meeting in Timken Science Hall 180
2:45 Poster Break

Earth and Space Science - Geology
3:15PM Saturday, May 4, 1996
Timken Science Hall 160
Shannan E. Peters - Presiding

3:15 STRUCTURE AND SUCCESSION OF PALEOCOMMUNITIES IN THE WALDRON SHALE. **Shanan E. Peters, Denison University, Dept. of Geology & Geography, Granville OH 43023.**

Four distinct benthic paleocommunities occur in the Waldron Shale (Wenlockian) of southeastern Indiana. Each of these communities is characterized by a unique faunal composition and/or distribution that changed in response to environmental modifications. Initially, the gentle topography of the underlying Laurel Member of the Salamonie dolomite controlled faunal distribution. Laurel Member hardground-highs were colonized by auloporids, stalked crinoids such as *Eucalyptocrinites*, and brachiopods, while bathymetric lows collected muds and maintained a low diversity assemblage tolerant of soft substrates. The resultant community structure was characterized by widely spaced centers of benthic life--"megalopolises." This assemblage was superseded by a high-diversity/high-abundance "metropolitan/village community. Microbioherms (0.1-4.0m algal-constructed masses) served as attachment points for a variety of species-- *Anastrophia, Whitfieldella, Eucalyptocrinites elrodi,* and others-- and were the centers of life. Smaller clusters of organisms, centered around *E.crassus* holdfasts, were scattered throughout the surrounding mud flats. Tempestites with disarticulated and fully articulated crinoids, as well as many species of brachiopods are common in this interval. A deepening of the sea and increased sedimentation rates extinguished this community. Replacing it was a high-diversity/low-abundance, or "rural wanderer" community dominated by mobile forms such as *Calymene, Dalmanites*, and *Naticonema*. Crinoids and brachiopods were far less abundant. Further deepening and low oxygen levels eventually limited the biota to only the most tolerant forms, such as *Strophochonetes*, and gave rise to the "outback" community.

3:30 SPATIAL PATCHINESS AND TAPHONOMY OF MOLLUSCAN SPECIES IN A SINGLE CORE: RELATIONSHIPS IN TIME AND SPACE, GRAHAMS HARBOR, SAN SALVADOR, BAHAMAS. **Tim Lynch, Hays Cummins, and Mark Boardman, School of Interdisciplinary Studies, Miami University, Oxford OH 45056.**

Community reconstruction is of paramount importance in paleoecological analysis. Here, we focused upon spatial variability in one core. Just how variable are community composition and taphonomic processes in the time and space represented by 2000 cm^3 of sediments? A shallow core, 10 cm across and 20 cm deep and representing hundreds of years of time-averaging, was taken from a lagoon in the Bahamas in a dense sea grass bed. The sample was divided horizontally and vertically into 68 subsamples. The shelly fauna were identified to species, and linear dimensions were measured for each hard bodied organism. The total core comprises over 15,000 individuals representing over so species. The two major goals of this project are 1) to investigate spatial patchiness on a microscale and 2) to recognize taphonomic processes in vertical and horizontal dimensions. Interestingly, the contents of the core were not well mixed. We found incredible spatial heterogeneity both in the horizontal and vertical dimensions in terms of species composition and the degree of taphonomic alteration. Shell destruction within the core appeared to be caused by dissolution caused by sea grass rhizome and root growth and decay. We will also report on: horizontal and vertical comparisons of molluscan abundance and diversity; taphonomic gradients within the core; and trends of species composition and community structure both vertically and horizontally.

3:45 THE DISTRIBUTION OF LIVE MOLLUSCS AS A FUNCTION OF SEAGRASS COVER IN A TROPICAL LAGOON, GRAHAMS HARBOR, SAN SALVADOR, BAHAMAS. **Mike DeVilliers, Hays Cummins, and Mark Boardman, School of Interdisciplinary Studies, Miami University, Oxford OH 45056.**

Community reconstruction is of paramount importance in paleoecological analysis. Here, we examined the living molluscan community to better understand the distribution and ecological framework of mollusc populations in a tropical lagoon. We compared ecologic parameters in the living community with seagrass cover with the goal of using the same ecological information from the molluscan death assemblage to predict the abundance of seagrass in the recent past. Live molluscs were collected from three environments of differing seagrass density to examine molluscan distribution as a function of seagrass cover. Forty-eight shallow cores were collected. At each sampling location, a seagrass cover index was also determined by counting the seagrass species present and the number of blades per species per .25m^2 of sea floor. Each living mollusc was identified within each core. Molluscs were categorized according to ecologic role- herbivore, parasite, carnivore, omnivore, deposit feeder, filter feeder; type- bivalve or gastropod; total number of live molluscs; and life location- infauna or epifauna. To date we have obtained significant results ($P<0.05$) among the three environments within Grahams Harbor using ANOVA and MANOVA for seagrass cover, bivalve/gastropod ratios within each core, and the number of carnivores, scaphopods, herbivores, and deposit feeders present.

4:00 RECONSTRUCTING BENTHIC COMMUNITIES UTILIZING MOLLUSCAN DEATH ASSEMBLAGES IN TROPICAL MARINE SEDIMENTS: THE RELATIONSHIPS AMONG SPECIES COMPOSITION, MODE OF LIFE, ECOLOGICAL ROLE AND SEAGRASS DENSITY. **Matt Dostal, Hays Cummins, and Mark Boardman, School of Interdisciplinary Studies, Miami University, Oxford OH 45056.**

The death assemblage is the first step in the formation of the fossil record and also preserves a time-averaged record of past hard-bodied community composition. Live and dead molluscs from 48 cores were collected from three environments of differing seagrass density. Molluscs were categorized according to ecologic role- herbivore, parasite, carnivore, omnivore, deposit feeder, filter feeder; type- bivalve, gastropod, or scaphopod; total number of live molluscs; and life location- in fauna or epifauna. To date we have obtained significant results ($P<0.05$) within Grahams Harbor using ANOVA and MANOVA in the following instances: Molluscan types were significantly different among environments for the number of bivalve, gastropod, and scaphopods present, life location- in fauna and epifauna, and ecologic roles- the number of herbivores, parasites. carnivores, deposit and filter feeders present. When examining the effects of seagrass density, significant results were found for the number of filter feeders, herbivores, and in fauna present in the death assemblage. When comparing the life assemblage with the death assemblage for ecologic roles, type of mollusc, and life locations significant results were found in every instance suggesting either that the living community was under sampled or that the time-averaged death assemblage contains a mixture of many unique communities, the sum of which are more distinctive than the "snapshot" of the living community we obtained.

4:15 MOLLUSCAN PREDATION: THE RECORD AS SHOWN IN THE DEATH ASSEMBLAGE AND HOW IT RELATES TO SEAGRASS COVER IN A TROPICAL LAGOON, GRAHAMS HARBOR, SAN SALVADOR, BAHAMAS. **Joseph Ison, Hays Cummins, and Mark Boardman, School of Interdisciplinary Studies, Miami University. Oxford Oh 45056.**

Predators play an important role in benthic community structure. In the time-averaged molluscan death assemblage in Grahams Harbor, evidence of past predation consists primarily of bore holes of shells by carnivorous gastropods. Here, we examined the ecological roles of the species being preyed upon from three distinctive environments: a dense seagrass bed, 3m in depth, a backreef area, 6m in depth, and a seagrass-sand transition, 3m in depth. At the location of each of the 48 cores collected, a seagrass cover index was calculated. Forty-eight shallow cores were collected. Bored molluscs were categorized according to ecologic role- herbivore, parasite, carnivore, omnivore, deposit feeder, filter feeder; type- bivalve or gastropod; total number of bored molluscs, and life location- in fauna or epifauna. There were significant differences ($P<0$ 05) in the ecologic roles of molluscs preyed upon among environments. Seagrass cover is of paramount importance in determining which ecologic roles are preyed upon preferentially from one environment to the next. We found that bivalves are bored more frequently than gastropods regardless of the environment they were collected in. In some molluscan species, over 30% of the individuals in the death assemblage were preyed upon. Carnivorous gastropods, despite their reputation for carnivory of other molluscs, were the most favored prey items in the seagrass-sand transition environment. Also, infauna were bored more often than epifauna in each environment.

Education Division

Education
9:15AM Saturday, May 4, 1996
Timken Science Hall 220
Michael Grote - Presiding

9:15 PROTECTING WATER QUALITY THROUGH THE SUCCESSFUL INTEGRATION OF RESEARCH AND EDUCATION. **N.L. Watermeier and L.C. Brown, Agricultural Engineering Department, The Ohio State University, Columbus OH 43210-1057.**

Concerns about how farming effects water quality and maintaining a viable, profitable agriculture prompted the USDA to select sites in five Midwestern states to model an effective partnership of research, demonstration, and educational programs. Management Systems Evaluation Area (MSEA) sites are located in Missouri, Iowa, Minnesota, Nebraska, and Ohio. The objective is to evaluate the impact of farming practices on water resources, to demonstrate practices to farmers, and to increase the adoption of practices that will maintain and enhance water quality. The cornerstone of this program is the close integration of research and education within and between projects, through a broad-based partnership of scientists, educators, agencies, and organizations. The regional MSEA education component has helped producers make better management decisions that protect water resources by providing public awareness information, demonstrating new farming technologies and strategies, and providing educational and technical assistance. These regional efforts focus on nutrient and pesticide management, water management, and other Best Management Practices. Ohio has provided water quality information and support to more than 10,000 agricultural producers and landowners, and other users through a variety of outreach mechanisms.

9:30 GREENHOUSE GASES AND THE 5% SOLUTION. **Glen G. Kizer, PO Box 163340, Columbus OH 43216.**

One of the most hotly debated topics for the remainder of the 1990s will be whether or not global climate change is being caused by the warming of the atmosphere. The trend in current thought is that greenhouse gases are going to melt the polar caps and these greenhouse gases are the result of burning fossil fuels. The Rio Treaty and the Berlin Accord are going to eventually result in federal mandates for the limitation of greenhouse gases. There is a public debate taking place within the scientific community and within both media and political arenas. The issue will remain a volatile one for many years. We need to create a project in which a coalition is formed on at least some parts of the issue. in Ohio, we could meet the targets currently contained in the growing number of international accords. We could switch to nuclear power or we could all buy cars that are 25% more fuel efficient, or we could retrofit our power plants. These things are difficult to implement into a culture where few people even understand the phrase greenhouse gases or the issue of global climate change. Or we could plant trees. To accomplish a 20% reduction in year 2000 CO_2 projected levels we would have to increase tree cover in Ohio from the 30% cover of 1990 to a 35% cover in the year 2000. This is a 5% increase. Estimates are that this would cost $1.7 billion. It will not. We will accomplish this goal and we will educate our state population on the entire air cycle so that they better understand the issue and both sides of the debate. We improve the environment and educate our adult population at the same time. My paper will talk about the coalition we are forming among environmental, business, and government groups to get the trees planted to improve the scientific literacy of the adult population at the same time.

9:45 THE SINGLE COMMUNITY CONCEPT: A MODEL FOR ADULT ENVIRONMENTAL EDUCATION. **Glen G. Kizer, PO Box 163340, Columbus Oh 43216. Marilyn E. Baker, Ohio EPA, Ohio Environmental Education Fund, PO Box 1049, Columbus Oh 43266.**

The scientific literacy of the adult population in this country is horribly low. This is one major reason that the scientific community does not get the respect and funding that it needs to solve our many environmental problems. Even simple things like recycling take decades to integrate into our culture because so few of our adults have any understanding of basic scientific principles. The one thing that we do know is that most adults did not learn science in school and they are not learning science as adults. We must develop methods for teaching our adult population the science they need to function in the world. Our project will involve simple scientific concepts that relate to environmental issues. We will go into a single community and survey 20% of the adult population as to their understanding of basic principles such as the water cycle and drinking water, the air cycle and clean air and global climate change, waste reduction and pollution prevention and recycling, wetlands and ecosystems, and sustainable development. We will then conduct a number of educational activities involving local businesses and governments and schools designed to create a better understanding of these issues. For example, one local restaurant chain has agreed to give free desserts to anyone answering correctly to 8 out of 10 questions on drinking water. The local movie theater chain will run slides before the movies on the value of trees in the air cycle. Then, after a one year period of these activities, we will then survey 20% of the population again to determine if any of the activities resulted in an improved scientific literacy on any of the issues. The activities will be tracked so that we can connect them with any improvements. We should then be able to demonstrate certain activities that result in real learning for adults.

10:00 KNIGHTS OF SCIENCE. **Michael G. Grote, Department of Education, Ohio Wesleyan University, Delaware OH 43015.**

Pre-service teachers designed and built inquiry-based science activities appropriate for 10-year olds. These activities were transported to a local elementary school where 4th graders and their parents were invited to complete the activities together. Over 50% of the elementary school students and their parents returned to school to participate on each of three evenings. Pre-service teachers overwhelmingly believed that the activity was successful and indicated that they would be likely to duplicate such a program for their classes when they became teachers. Parents also universally praised the program and requested ideas for similar activities that they could do with their children at home. The program allowed parents to experience hands-on science. Parents frequently remarked that they might have liked science in school if it had been taught using this approach. Teachers at the school were pleased to see parents they had not seen before at school functions. The fourth graders also gave the program their approval and requested more sessions. The program was funded by the Federal Commission on National and Community Service and the Ohio Campus Compact.

10:15 EPICENTER TEACHERS' WORKSHOP. **James B. Short, Gorham Fayette High School, Gamber St., Fayette OH 43521.**

The Earth Processes Instructional center or Epicenter, located at Purdue University, is working with middle school teachers from six midwestern states to improve Earth Science instruction, to implement technology into the classroom, and to encourage constructivist activities in science classrooms. Teachers from Illinois, Indiana, Michigan, Kentucky, Missouri, and Ohio are hosted by the Epicenter for four weeks where they attend classes, produce

lesson plans, and actively participate on field trips and lesson demonstrations. This workshop, funded for three years by a National Science Foundation grant, provides a teacher stipend, travel and meal allowance, room, course fees, and many special classroom materials. After completion of the workshop, participants are provided classroom support from the Epicenter directors and its trained staff of master teachers. A spring follow up meeting is conducted at the National Science Teachers' Association meeting or other regional meetings. This presentation will discuss the program and provide information to encourage Ohio's outstanding fifth through ninth grade teachers to apply for this very worthwhile program.

10:30 GENDER EFFECTS OF LEARNING CYCLE METHOD ON STUDENT LEARNING IN SEVENTH GRADE LIFE SCIENCE CLASSES. **Joseph M. Cumo, Ashtabula County Educational Service Center, P. O. Box 186, Jefferson OH 44047-0186.**

This study compared effects of two different methods of teaching select science concepts related to osmosis to seventh grade students in rural Ohio schools. Two classes experienced the Learning Cycle method (LC) of introducing these topics in an explore/invent/discover sequence; two classes were taught by the Traditional method (T) of inform/verify/practice format; and control group classes that were not yet instructed on osmosis were all pretested and post-tested on content knowledge, attitudes toward science, process skills, and formal reasoning. Data suggest that the LC method of instruction is superior to the more prevalent T method for encouraging process skills, positive attitudes toward science, and cognitive development in seventh grade students. Differential effects by gender were noted on gains in content knowledge and in positive attitudes toward science.

10:45 SUSTAINABILITY OF THE ANTHROPOSPHERE: EDUCATORS' SCENARIOS FOR THE END OF HUMAN POPULATION GROWTH. **Garry McKenzie and Carol Landis, Geological Sciences, The Ohio State University, Columbus, OH 43210-1398. McK+@osu.edu.**

Single-page responses to the final exam in the graduate course "Population and Resources in the Earth System" provide insight to perceptions of ultimate sustainability. The take-home exam question was: "Give your interpretation. in the form of a scenario that describes the future and how we will get there, of the process by which growth in human population will end. Include the factors and their impact that will be involved in this change, responses of the human colony, the dates of major events and thresholds, and the nature of the world, population size, and quality of life for the 100 years after growth ends." Most of the 30+ grad students were in Education, current or former teachers with knowledge of the literature on population growth. Scenario detail ranged from cursory to comprehensive. Many projected a population growth to 12-18 billion, before shortages of food, water, and energy, accompanied by disease (airborne Ebola-type viruses, organic and inorganic pollution), wars, loss of biodiversity, and environmental degradation limited growth. Almost all predicted a collapse and eco-refugees. A variety of adjustments to these conditions (with degrees of success) usually resulted in a population of 14 billion. Scenarios showed exceptional creativity, describing events which led to changes in religious and governmental understanding of population and sustainability ranging from the coming of a savior to the development of bar-coded individuals. Post-transition quality of life ranged from stable, resource-rich populations trading for education and technology in a peaceful world, to a growing population destined to repeat the cycle, with a crash that we do not survive. All scenarios foresee a degraded Earth by 2100.

Education
2:15PM Saturday, May 4, 1996
Timken Science Hall 220
Jim L. Jackson - Presiding

2:15 SUSTAINING THE DISCUSSION: ECOLOGY IN THE HUMANITIES CLASSROOM. **John M. Kandl, English Dept., Walsh University, 2020 Easton St. NW, North Canton OH 44720.**

We should not lose sight of the ways in which technological and economic issues confronting sustainability are grounded in what Faulkner has called "the verities of the human heart in conflict with itself." The challenge which faces us today must be perceived as requiring more than a technological fix--the challenge indeed, as deep ecologists have been pointing out for some time now, goes directly to our most fundamental conceptions of our relationship to the natural environment. As one historicist states: "the environment, seen first as a technological and scientific problem, then as an economic and political one, has become a philosophical and ethical one" (Young, Sustaining the Earth, Harvard UP, 1990, p.x). To adequately meet this challenge we will need to confront these fundamental conceptions--and I would argue that the most natural environment for doing so is that of the humanities classroom. From my own experience teaching literature, I would suggest that any humanities course can be instrumental in engaging students with a range of environmental issues, giving rise to the kind of analysis and general ethical and philosophical discussion necessary to sustain the ideal of sustainable development.

2:30 STUDENTS, ENVIRONMENTAL SCIENCE, MULTIMEDIA, AND PREDICTION OF SUCCESS. **Jim L. Jackson, John J. Hirschbuhl, Dwight A. Bishop, David A. Massaro, 7448 Birkner Dr., Kent OH 44240.**

Freshmen arriving at universities and job applicants for industrial positions bring a broad range of previous experiences with them. Massaro found the number of math courses completed in high school and their scores on the instrument, Group Assessment of Logical Thinking, were strong predictors of student success in a college level science course. In short, problem solvers tend to be more successful. Industry is also interested in problem solvers. Multimedia laboratory experiences were developed to promote problem solving and expose users to authentic learning experiences. Users of the experiences find an extensive computer environment where they obtain, evaluate and interpret environmental data. The experience forces students to move from the concrete to higher level interpretations. Most of our presentation demonstrates the multimedia problem solving experiences. The multimedia materials are set in a Windows environment, and industry will find prospective employees can be evaluated using these materials. In addition, job applicants can learn Windows environment skills, while sharpening their problem solving skills.

2:45 A QUALITATIVE/ QUANTATATIVE ANALYSIS OF THE ADMINISTRATIVE MANAGEMENT INSTITUTE AT CORNELL UNIVIRSITY. **Dianne Brown-Wright, The University of Akron, The College of Education 410-C Zook Hall. Akron OH 44325-4208.**

Cornell University is one of several prestigious American universities offering a summer management development institute for college and university administrators and managers. Cornell University's Administrative Management Institute (AMI) has been in existence only since 1993, however, and therefore, little if any mention has been made of it in the literature describing higher education management development programs. The presenter, also a participant-observer in Cornell University's 1994 AMI, attempts to address this gap in the literature. Results of an AMI participant survey conducted by the researcher, including participant demgographics and perceptions, program benefits and features, and recommendations for further research are shared. Findings indicate that a greater emphasis needs to be placed on personnel management and leadership as dimensions of the AMI management development program. In addition, follow-up studies related to future sessions should be conducted to further inform decision-making concerning program features. Replication is also suggested in terms of providing for comparative participant perceptions related to other nationally renowned higher education management development programs.

3:00 THE USE OF TECHNOLOGY IN HIGHER EDUCATION PROGRAMS: A NATIONAL SURVEY. **Dianne Brown-Wright, Ph.D., The University of Akron, College of Education, 410-C Zook Hall, Akron OH 44325-4208.**

Changes in student lifestyles and demographics argue for alternative modes, places, and times of instruction. The purpose of this study was to investigate the use of technology in graduate programs in Higher Education in the United States. The researcher also sought to determine perceived constraints to such utilization as well as incentives at either the college or university level to encourage the use of technology in the delivery of instruction. A national survey was conducted using the Directory of the Association for the Study of Higher Education (ASHE) Higher Education Program Directors. Survey results were examined, with a particular eye on the identification of technologically based active learning strategies which could be easily replicated. While some of the initiatives identified as technologically used appeared to be being fully implemented, most others were found to be in the early stages of formulation. Limited faculty time, knowledge, skill, and resources were found

to be major constraints to technology based instruction development and implementation. Incentives varied from the availability of mini-grants to release time.

3:15 REVITALIZING THE FIRST YEAR BIOLOGY EXPERIENCE AT CAPITAL UNIVERSITY. KERRY L. CHEESMAN, BIOLOGY DEPT., CAPITAL UNIVERSITY, 2199 E. MAIN ST., COLUMBUS OH 43209.

Prior to 1994 the introductory sequence for biology majors at Capital University consisted of a fairly traditional approach - Introduction to Biology followed by Zoology and Botany courses. Both science and nonscience majors shared the introductory course, which meant that the skills level of the class as a whole was usually low. This proved to be unsatisfactory for the biology majors (including premedical) with retention of majors in the program averaging just 74% between the first and second semesters, and 60% between the freshman and sophomore years. Starting in 1994 a new freshman sequence was introduced which separated biology majors from nonmajors and used an integrated, experiential format to teach the foundational theories of biology. Greek and Latin scientific terminology were introduced in week one and continued throughout the semester, and laboratory exercises were rewritten to be more investigative. The expectations for biology majors were increased, and students were informed about the reason for these changes. The department faculty spent time relaying information about the department, careers in biology, and study time expectations for science majors. As a result of these changes, retention rates among biology majors has risen to 92% and students report a stronger commitment both to the department and to the university. It remains to be seen whether or not these changes will be reflected in graduate and professional school acceptances in coming years.

3:30 PREDICTING SUCCESS RATES OF FRESHMAN LEVEL PREMEDICAL STUDENTS. KERRY L. CHEESMAN, BIOLOGY AND CHEMISTRY DEPTS., CAPITAL UNIVERSITY, 2199 E. MAIN ST., COLUMBUS OH 43209.

As medical school application numbers continue to rise, premedical advisers and department chairs are coming under increased pressure from students, parents, and faculty to maintain high success rates for senior students applying to medical schools. To do this well, especially in an era when the number of freshman students self-selecting a premedical major or tract is increasing dramatically, requires some way to predict overall success rates and thus redirect those freshmen who are not likely to be accepted into medical school. To find such a predictor, records of all students at St. Francis College who had applied to medical school during the years 1986 to 1992 (n = 38) were analyzed. High school GPA, ACT scores, and grades in freshman science courses were compared with acceptances at medical school. Positive correlating (Pearson) were found between math ACT score and first semester biology grade (.39), math ACT and first semester chemistry grade (.67), and math ACT and first semester GPA (.60). A positive correlation (.72) was also found between math ACT score and medical school acceptance. The ACT reading score was not significantly correlated with any of these. A math ACT score less than 22 was never associated with successful medical school admission. Thus, while one cannot predict which students will be admitted to medical school, it appears that one can reasonably use math ACT (or SAT) scores to encourage students to rethink unrealistic expectations early in their college careers.

3:45 EVOLVING TECHNOLOGY: SCIENCE AND MATHEMATICS REFORM WITH SUSTAINABLE CONNECTIONS. DR. ROBERT E. MCNEMAR, 5618 WORCESTER DR., COLUMBUS OH 43232.

Evolving technologies will be demonstrated in counting, measuring, calculating and design to illustrate the reforms and connections in the development of science and mathematics concepts for use in an expanded information era. In this technological information era, with knowledge expanding at an exponential rate, it is impossible to identify which "Science and Mathematics Concepts" to teach students who are to be productive citizens in the next century. The important impact that science, mathematics and technology will have on their lives will be how concepts are experienced by the students as they are involved in the processes and basic skills that appear to be important in the present time frame. Students must be inspired to desire to learn by building positive attitudes toward the academic areas in their formative years. The students must be equipped with the art of connecting related concepts.

4:00 A IS FOR ASTRONOMY. NORMAN A. MANKINS, CANTON CITY SCHOOLS, 617 MCKINLEY AVE. S.W., CANTON OH 44707.

Bring the world of astronomy into the classroom with kid-proof 4" reflecting telescopes. Grassroots Science Teacher-Leader Institution, a teacher enhancement project of the Canton City Schools, will show you how to do it! During the 1995 summer institute, forty K-8 classroom teachers, under the guidance of a local astronomy club, constructed optically sensitive, child-proof reflecting telescopes for each elementary and middle school building in the district. Working in cooperative, grade-level groups, interdisciplinary lessons were developed that centered on using the telescopes. These lesson plans have been integrated into the science curriculum in diverse ways. During this session, detailed information on how to make your own telescopes will be shared. Lesson planning ideas, thematic units, and simple hands-on activities will also be shared during this session. Grassroots Science Teacher-Leader Institute is supported by National Science Foundation Grant #ESI9353464.

4:15 PHYSICS AND ART: UNCOVERING CONCEPTUAL LINKAGES. CLAUDIA KHOUREY-BOWERS AND CYNTHIA B. CROLEY, CANTON CITY SCHOOLS, 617 MCKINLEY AVE. S.W., CANTON OH 44707.

Assumptions which underlie classical modern physics may create barriers to understanding modern physics. By analyzing changing conceptions of time, space, and light from a historical perspective, first from an artist's standpoint and then from a physicist's standpoint, these barriers may be removed. Collaborative presentations by an artist-educator and a physics teacher have been developed to guide first-year honors students through these conceptual shifts. Three historical eras were selected: Medieval, Proto-Renaissance, and Modern. For each era, the guiding conceptual assumptions in both fields were explored, an art project was conducted, and students wrote essays reflecting their personal understanding. The culminating project, using multiple media in a student directed work, demonstrated their conceptual shifts. This work has been supported by the AAPT High School Physics Innovative Teaching Grant Program and the Impact II Program.

PHYSICAL & MATHEMATICAL SCIENCES DIVISION
INFORMATION, COMPUTING & COMMUNICATIONS DIVISION

PHYSICAL SCIENCES COMPUTING AND INFORMATION
9:00AM SATURDAY, MAY 4, 1996
FOUNDERS HALL 39
RAVI K. NADELLA - PRESIDING

9:00 ONTOGENY/GONADAL CONTROL OF RAT LIVER 6-HYDROXYMELATONIN SULFOTRANSFERASE. ERIK M. PEDEN, MELISSA LIMP-FOSTER, JULIE A. PAPP, AND SANFORD S. SINGER, DEPARTMENT OF CHEMISTRY, UNIVERSITY OF DAYTON, DAYTON OH 45469.

Our lab previously developed an assay for the rat liver 6-hydroxymelatonin sulfotransferase (6HMST) activity and observed male-dominant sex dimorphism. Here, we explored the dimorphism's basis. First, 6HMST activity was examined in 10-40 day old, 2-6 mo. old, and >10 mo. old rats. Activity in females rose until day 30. In males it increased until adulthood. The dimorphism was not apparent until puberty, suggesting gonadal regulation. To test this, the effect of castration was examined. 6HMST activity was unaltered in female castrates. Male castrates exhibited a marked decline in the enzyme activity. Effects of estradiol or testosterone on males and females, respectively, were also studied. Androgen had no effect and estrogen led to large drops in 6HMST activity. Ion exchange chromatography suggested that one enzyme causes the 6HM sulfation in all cases. The data are related to earlier studies of sulfation of 6HM & related substrates.

9:15 EXAMINATION OF THE VIABILITY OF THE SUSPENSION DEPOSITION METHOD. LORIE L. MARTIN AND ROBERT F. MAULDIN, DEPT. OF NATURAL SCIENCES, SHAWNEE STATE UNIVERSITY, PORTSMOUTH OH 45662.

The fate of polycyclic aromatic hydrocarbons (PAH) released into the environment by fossil fuel combustion is important because these carcinogenic compounds adsorb on airborne coal fly ash particles emitted by coal-fired power plants. In an effort to mimic this natural process, the spike method (small volume of solution with a large mass of ash) and the slurry-spike method are two commonly used deposition techniques. The suspension method, a newer, less commonly used technique, of depositing anthracene on coal fly ash particles (6.17% C) was examined to attempt to develop the procedure and determine its viability as a deposition method. It has been shown that this deposition method provides a more homogeneous coverage of the PAH on the ash surface. In a sepratory funnel, ash was allowed to settle in a 206 ppm solution of anthracene in methanol. After collecting and allowing the ash to dry, quadruplicate Soxhlet extractions were run for 24 hours. The solution remaining in the funnel was quantified using UV-visible spectrophotometry. Of the 185 µg anthracene /g ash deposited, 57 +/- 6% was recovered. The effect of varying the solution concentration on the resulting surface concentration will be discussed.

9:30 DIAMOND FOR ELECTRONIC DEVICES. **Ravi K. Nadella, Joy L. Johnson, Wilbur L. Wheeler, and Raymond A. Haraway, Division of Engineering and Computer Science, Wilberforce University, Wilberforce OH 45384.**

Diamond is not only a friend to women, but also a friend to the electronics industry due to its properties like large band gap, high peak electron velocity, high breakdown field, high thermal conductivity, radiation tolerance, and chemical stability. These properties allow electronic devices made in diamond to be operated at extreme conditions. Ion implantation is a popular technique to dope electronic materials for obtaining n-type,p-type, and high resistance layer needed to make electronic devices. In our study, we used phosphorous (P) ion implantation to obtain n-type layers. The first four range statistics of P in diamond were obtained. These were found to be more than the corresponding theoretical values. Preliminary results on electrical characterization indicate n-type layers. P atoms did not redistribute even after 1200°C/ 2.5 min. furnace annealing. Detailed results on P ion implantation and the fabrication of electronic devices in diamond using P ion implantation will be presented at the conference.

9:45 COMPUTER SCIENCE IN CYBERSPACE: A NEW ELECTRONIC LITERATURE. **J B Hill, University of Akron, Science & Technology Library, Akron OH 44325-3907.**

Historically journal literature has been a widely accepted method of scholarly scientific communication. With the advent of instantaneous internet transmission, scholarly communication has begun to change. Ideas are communicated through email, listservs, bulletin boards and increasingly electronic journals. Since the cyberspace community is a relatively computer savvy population, there is a ready-made audience for computer information on the internet. The electronic journal has emerged as a vehicle to organize and present this information The content of many of the current journals is popular rather than scholarly, and the ease with which would-be electronic publishers can make their journals available makes the quality of the literature suspect. However, the recent entrance of professional societies and established print publishers into the electronic journal marketplace has added quality to the existing large quantity of computer literature on the net.

10:00 COST, IMMEDIACY, IMPACT, AND USE: VARIABLES FOR SCIENCE SERIALS EVALUATION. **Nancy Hayes and J.B. Hill, University of Akron, Science & Technology Library, Akron OH 44325-3907.**

Serial publications are the primary avenue for the exchange of scientific research. An explosion of information, resulting in an increase in titles and volumes, comes at a time when science libraries are confronted with problems of serials price inflation, budget constraints and space limitations. As a result, libraries need to use both qualitative and quantitative measures to systematically evaluate science serials collections. Qualitative measures, such as the Institute for Scientific Information's impact factors and immediacy index, often prove to be valuable bibliometric tools at the point of serials selection. Quantitative measures, such as cost and use, are often more compelling considerations at the point of serials cancellations. Science bibliographers need to recognize the problems associated with the use of each of these variables and consider the merits of all four measures when evaluating a serials collection's quality and utility.

Environmental Sciences & Resource Management Division

1:00 - 2:00 PM Follow-up Interactive Session with Dr. Thomas Gladwin. What difference will sustainable development make for MY community?

Randall Campus Center Stewart Community Room

Environmental Issues of Sustainable Development

2:15PM Saturday, May 4, 1996

Founders Hall 39

Frank J. Costa - Presiding

2:15 SUSTAINABILITY: ORIGINS AND EVOLUTION OF A CONCEPT. **Frank J. Costa and Allen G. Noble, Department of Geography and Planning, University of Akron, Akron OH 44325-5005.**

The intellectual origins of the sustainability concept are examined. These include garden city and anarchical self sufficiency theory of the late 19th and early 20th century. Later 20th century contributions to the concept of sustainability are also explained. Divergent approaches to, and attitudes about, the concept are examined from the perspectives of both the developed and developing world. Emphasis is placed upon sustainability as it relates to urbanization, planning and eco-tourism.

2:30 DEFINING SUSTAINABLE TOURISM DEVELOPMENT IN THE CONTEXT OF SMALL ISLAND DEVELOPING STATES (SIDS) OF THE CARIBBEAN. **Adrien G. Humphreys, Department of Geography and Planning, The University of Akron, Akron OH 44325-5005.**

There is no significant or substantive definition of sustainable tourism development in the broad sweep of literature that has emerged during the past two decades. The literature suggests that it is difficult to develop a definition of sustainable tourism development since the concept is still in an infancy or evolving stage. Even more importantly, it is suggested that the challenges and problems affronting sustainable tourism development are largely region-specific. In this paper, the small developing island states (SIDS) of the Caribbean is used as a microcosm for developing a working definition of sustainable tourism development. Within this context, sustainable tourism development is defined as "tourism which is developed and designed to remain viable over an extended period of time while placing minimum demands on the natural environment and aggressively protects the ecosystems of the region." The main idea underlying this definition is that tourism development should continue in the small island developing states but within the bounds of the environmental limits of the region.

2:45 SUSTAINABILITY IN ECOTOURISM IN BELIZE. **Laura A. DeYoung, P.O. Box 138, Bath OH 44210.**

Ecotourism provides a conservation preservation technique, preserving ecosystems and species as well as man's historic cultural resources from developers and locals who want growth through usurping the natural resources. This paper looks at Belize's use of ecotourism as a sustainable economic development tool: (1) to protect ecosystems, endangered species, and historic cultural resources by creating enough local economic gain in the private sector and enough social benefit in the public sector to generate an incentive to protect rather than destroy the ecosystem; and (2) to avoid negative impacts on the ecosystems, species and historic cultural resources by identifying tolerable levels of carrying capacity.

3:00 COMPARATIVE SUSTAINABILITY POLICIES IN INDIAN CITIES. **Christopher D. Cusack, The University of Akron, Department of Geography and Planning, Akron OH 44325-5005.**

Historically, development efforts in the major Indian cities of Bombay, Calcutta, and Delhi have primarily been aimed at traditional concerns such as housing and infrastructure. Recently, however, the issues of environmental sustainability and conservation have been incorporated into development plans for these cities. These cities then, offer the unique opportunity for a comparative analysis of local implementation of sustainability into planning and development. Therefore, the objectives of this paper are: to provide an overview of the primary planning and development efforts in Bombay, Calcutta, and Delhi since Independence; examine the more recent attempts of these cities to manage sustainable development; provide a comparison of sustainable development practices between the cities; and identify prospects and problems facing future sustainable development in these cities.

3:15 URBAN LANDUSE POLICIES FOR BANGLADESH TOWARDS A SUSTAINABLE FUTURE: SOME ISSUES AND OPTIONS. **Ishrat Islam, Graduate Program, Department of Geography and Planning, Buchtel College of Arts and Sciences, The University of Akron, Akron OH 44325-5005.**

Landuse policies are important for the growth of an urban area. For a developing country such as Bangladesh, these policies are often prerequisite for a sustainable future in terms of development. High density of population, scarcity of land, unplanned growth and expansion of cities, less accessibility of the poor in the land market and overall environmental degradation are the principal factors that stand out, when we talk about sustainable third world cities. Some of the developing countries of south and east Asia have already been alarmed by the present situation and to avoid future disaster, they have undertaken a number of innovative approaches to fight the landuse problems. This paper discusses various issues and options related to the Urban Landuse Policies for Bangladesh in the light of experiences from projects undertaken in a number of developing Asian cities. Landuse policy is complex and necessarily interrelated with other national factors. The economic constraints, limitation of resources and prevailing sociopolitical situation in Bangladesh play predominant roles while formulating landuse policies. A well defined land policy is a key requirement for planned expansion, development and growth of cities in Bangladesh. It would enable the government to design cities for a sustainable future.

3:30 SUSTAINABLE DEVELOPMENT LITERATURE OF THE "DEVELOPED" AND "DEVELOPING" WORLDS: A BIBLIOGRAPHY OF DIVERGENCE. **Rich H. Harrill, University of Akron, Department of Geography and Planning, Akron OH 443255005.**

It has become increasingly apparent since the conceptual origins of sustainable development that the nations of the "developed" and "developing" worlds have adopted radically different postures concerning sustainable development due to conflicting cultural traditions and historical experiences. This bibliographic essay will argue that sustainability, as presented in the literature of the "developed" world, has degenerated into a cover for neo-colonial industrialized world dialogues with the developing world. At the same time, however, sustainable development as presented through authors writing from a "developing world" perspective in contrast appear to capture the global spirit of ecological sustainability. This paper will not present "the best of" sustainable development literature, but only a cross-section of sustainable development literature reflecting diverging institutional and individual perspectives. A bibliography of selected items from each category will be presented at the conclusion of this paper. It is hoped that a presentation of the more pronounced differences will provide an improved understanding of sustainable planning strategies in "developed" and "developing" world settings. Furthermore, this essay should demonstrate the need to relate the content and range of sustainable development strategies and institutions to the dominant social, political and economic values found in urban settings.

Water Issues
9:00AM Saturday, May 4, 1996
Founders Hall 24
Jay M. Johnson - Presiding

9:00 LAND-USE PLANNING FOR SUSTAINABLE DEVELOPMENT USING THE INDEX OF ECOLOGICAL INTEGRITY. **Laura K. Mataraza, Elizabeth L. Buchanan, Ken Joehlin, R.J. Laverne, Jay Abercrombie, Todd Crandall, Michael D. Johnson, Ken Christensen, Karen Wise, ACRT, Inc. P.O. Box 401, Cuyahoga Falls OH 44221.**

Public officials and planning agencies need sound environmental data on which to base guidelines for sustainable development. These data should be provided by qualified experts in a manageable, easy-to-understand format. We introduce an ecological planning tool to be used by local gvvernments for this purpose. The Index of Ecological Integrity (IEI) evaluates the ecological value of undeveloped lands and assigns metric values to each contiguous parcel or vegetation cover type. These parcels are then prioritized based on this estimated value numerical results are graphically presented in a series of geographical information system (GIS) base maps with recommendations for land-use planning. Using this information, local agencies can prepare legally defensible guidelines for sustainable development. For example, areas with high ecological value may be considered for low impact land-use activities or conservation easements. Conversely, low quality areas may be targeted for higher impact activities. The IEI has wide application for the planning community to assess environmental infrastructure.

9:15 EVALUATING DRAINAGE DESIGN PARAMETERS FOR WASTEWATER IRRIGATION APPLICATIONS TO MINIMIZE IMPACT ON SURFACE WATERS. **L.C. Brown, P.M. Holdsworth, T. Oztekin, and A. Kurunc, Agricultural Engineering Department, The Ohio State University, 590 Woody Hayes Drive, Columbus OH 43210-1057.**

DRAINMOD, an agricultural water management computer model, was used to evaluate the hydrology for a wastewater irrigation scenario for the Village of West Mansfield, Ohio. This model was used to simulate the runoff potential of the proposed site under drainage and wastewater irrigation, evaluate subsurface drainage system design parameters and irrigation interval, and predict the effect of wastewater irrigation on potential crop yield. A 40-year climatic record and USDA Soils5 data were used as inputs to the model to evaluate hydrologic response over a range of input values of irrigation rate and interval, and drain spacing and depth. Simulation results indicate that an irrigation interval of 1 or 2 days could meet the annual irrigation application criteria of 67 cm. Frequency analysis of runoff volume over the 40-year period for the 2-day irrigation interval revealed that approximately 99% of the application days had zero runoff. A response surface of average annual irrigation volume for the 2-day irrigation interval indicated that the target annual irrigation volume of 67 cm can be attained with a range of drain spacing (7.5 to 12.5 m) and depth (85 to 150 cm) combinations. Within the range of drain spacing and depths evaluated with wastewater irrigation at the 2-day irrigation interval, relative crop yield increased when an increase in drain depth was coupled with a decrease in drain spacing.

9:30 AQUATIC ECOLOGICAL SURVEY PRIOR TO THE CONSTRUCTION OF A SEWAGE TREATMENT FACILITY. **Michael D. Johnson, Jay Abercrombie, Elizabeth L. Buchanan, Todd Crandall, Karnyn L. Givens, Laura K. Mataraza, Karen M. Wise, and Kenneth John Christensen, ACRT Inc. P.O. Box 401 Cuyahoga Falls OH 44221-0401.**

Northeast Ohio is currently undergoing an increase in economic expansion and development. The growth of many communities is often contingent upon the availability of reliable means to treat sanitary effluents. Sustainable growth requires the assessment of environmental conditions prior to increased development. We performed an aquatic ecological survey to evaluate the biotic integrity of a segment of the Grand River and to assess the potential environmental impacts of a new sewage treatment facility. Physical, biotic, and chemical parameters were quantitatively measured to determine overall water quality of a 3.42 mile stretch of the Grand River near Parkman Ohio. All sampling protocols followed guidelines of the Ohio Environmental Protection Agency (EPA). Habitat was assessed using the Qualitative habitat Evaluation Index (QHEI). Water chemistry sampling included both field and laboratory measurements. Macroinvertebrate communities were analyzed using the Invertebrate Community Index (ICI) and fish communities were analyzed using the Index of Biotic Integrity (IBI). QHEI values for two sites fell below the acceptable value for headwater streams in this ecoregion. All water chemistry parameters fell within the Ohio EPA established limits. However, ammonia-nitrogen levels were generally higher at sample sites downstream of Parkman. ICI values at three of four sampling stations were below the minimum value for headwater streams in this ecoregion. Fish communities scored high IBI values at sampling stations with extensive habitat, but fell below acceptable values at stations with less developed habitat.

9:45 Sr/Ca RATIOS OF SURFACE WATER OF OHIO. **Cheryl L. Essenburg, Department of Geological Sciences, Ohio State University, Columbus OH 43210.**

Surface water analyses in the last 35 years have shown anomalously high strontium abundance's in Ohio rivers and streams. To better understand the extent and origin of this strontium anomaly, all available surface water analyses including strontium and calcium data were compiled. Sr/Ca x 10_3 ratios were then calculated and averaged over each drainage basin in Ohio. Drainage basins with Sr/Ca x 10_3 ratios greater than the average crustal ratio of 5 (Faure 1991) include the Sandusky River, the Maumee River, the Olentangy River, the Great Miami River, the Mad River, and the Scioto River. High Sr/Ca ratios occur particularly in Scioto River tributaries northwest of Columbus. Recent sampling of river water has been done to augment the existing data. Comparison of compiled Sr/Ca ratios with the lithologic and glacial boundaries show that high Sr/Ca ratios correspond with Silurian carbonate bedrock and overlying till and that low Sr/Ca ratios correspond with unglaciated Devonian and Mississippian clastic rocks. Feulner and Hubble (1960) were the first to propose that high strontium abundance's originated from the mineral celestite ($SrSO_4$) which is known to occur in the carbonate bedrock and tills of Ohio. The compiled Sr/Ca ratios and their relationship to litholoyy supports this conclusion; however whether bedrock celestite or celestite in the till has more of an effect on Sr/Ca ratios is still in question.

10:00 DEGRADATION OF PHENOL USING CLAY/FLYASH MIXTURE SUPPLEMENTED BY BIOAUGMENTATION. **Howard H. Lo, Ravindra Wani, and Yung-Tse Hung, Dept. of Geological Sciences, Cleveland State University, Cleveland OH 44115.**

The objectives of this study were to investigate the effectiveness of adsorption treatment using clay/flyash mixture and the adsorption treatment supplemented by bioaugmentation with LLMO (liquid live microorganisms) for the treatment of phenolic wastewater. Parameters used in the study included wastewater strength, type and dosage of adsorbent, and type of LLMO. Clay and flyash were mixed in different proportions with a clay to flyash ratio of 3:1, 1:1, and 1:3. Strength levels of phenolic wastewater were 10, 50, and 100 mg/l TOC (total organic carbon). Dosages of adsorbents used were 0, 5, 10, 15, and 20 g/l. Five types of LLMO used were S-1, E-1, G-1, N-1, and NEW-I. Results showed that clay/flyash mixtures were effective in removing phenol from wastewater with TOC removal efficiency of greater than 70% for high strength wastewater. When clay/flyash adsorption was supplemented with LLMO bioaugmentation the phenol removal was increased to greater than 80% TOC removal efficiency. LLMO E-1 and G-I appeared to be more effective in phenol removal. It was observed that the phenol removal efficiency increased with wastewater strength and with adsorbent dosage. The high strength wastewater (100 mg/l TOC) treated with high dosage (20g/l) of clay/flyash mixture and with LLMO bioaugmentation had the highest phenol removal rate with 87% removal efficiency.

10:15 MIXING OF WATER IN THE BIG WALNUT CREEK, CENTRAL OHIO. **Timothy R. Petz and Gunter Faure, Department of Geological Sciences, Ohio State University, Columbus OH 43210.**

The concentrations of conservative cations and anions in streams are generally controlled by mixing of two or more components including groundwater, surface run-off, and water discharged by waste-water treatment plants, and other anthropogenic sources. Big Walnut Creek provides an opportunity to demonstrate the effect of mixing at its confluence with Alum Creek and Blacklick Creek and at its confluence with the Scioto River south of Columbus. The results show that the concentrations of the major conservative cations (Ca, Mg, Na, and Sr) of water in Big Walnut Creek, Alum Creek, and Blacklick Creek collected upstream of the confluences define mixing triangles as expected. The mixed water downstream of the confluences is represented by points that lie within the triangles of mixing. The relative abundances of water derived from the tributaries can be determined by resolving the cation concentrations of the mixed water into its components. Water collected from the Scioto River downstream from its confluence with Big Walnut Creek is anomalously enriched in Na caused by discharge of water from the waste-water treatment facility south of Columbus. The concentrations of the major conservative cations increase as Big Walnut Creek flows through Gahanna and gradually decrease downstream to the confluence with the Scioto River.

10:30 PLANT RESPONSES TO WASTEWATER BIOSOLIDS PRODUCED AT A PLASTICS MANUFACTURING FACILITY. **Dennis Bishop and Arthur Trese, Department of Environmental and Plant Biology, Ohio University, Athens OH 45701.**

Many municipalities and industries are faced with the environmentally sensitive problem of disposal of wastewater biosolids, the residual organic matter produced during wastewater treatment. Currently, much of this material is disposed of in land fills or incinerated, despite the fact that the material is rich in organic and mineral plant nutrients. We have examined the land application potential of biosolid wastes produced from Dupont's Washington Works, Parkersburg, WV. We have determined the average concentration of heavy metals and plant nutrients in the biosolids to arrive at maximum application rates based upon these criteria. In greenhouse studies we mixed the biosolids with either potting mix or two soils, at rates ranging from 50 to 0% biosolid. Growth responses of tomatoes, turnips, and beans were determined, including nodulation of beans. Biosolid/soil mixtures as high as 25% biosolids increased plant growth, but 50% biosolids consistently inhibited biomass accumulation. Elemental analysis of plant tissue indicated that excess nitrogen was the most detrimental element in mixtures containing high proportions of biosolids. Field studies have demonstrated that applications of this biosolid product enhances plant growth when incorporated at levels of up to 25% of the soil volume.

10:45 YELLOW FEVER'S EFFECT ON TRANSPORTATION AND COMMERCE. **Jay M. Johnson, Department of Geography and Planning, The University of Akron, Carroll Hall, Buchtel Common 306, Akron OH 44325-5005.**

The arbovirus called yellow fever has impacted transportation and thus commerce from the steam era to the present day. Human-environment interaction is important to communicable diseases. Mosquito habitat is examined closely in relation to spatial corridors of transport. The subgenus *Stegomyia* of the genus *Aedes* includes several mosquito vectors. The most famous and relevant of the vectors is *Aedes aegypti*. This mosquito favors standing water near houses, as may be found in old tires, rain puddles, and flowerpots. It does not enjoy woodlands of any type, tropical or otherwise. It is not a wetlands mosquito. Yellow fever can only remain endemic to tropical and semitropical regions without a killing frost. Current endemic regions are Africa, Central America, and South America. The United States have been free of yellow fever since 1878. Disproven theories and current findings alike are examined for lessons about sustainable commerce and development. The filth theory, transportability theory and germ theory affected everyday life during the debate over each hypothesis. The historical actions of railroads, cities, and states are viewed through the present-day kaleidoscope of virology and airline travel. African decolonization has led to national assertion in the last several decades, changing attitudes and funding for public health and disease control.

1:00 - 2:00 PM Follow-up Interactive Session with Dr. Thomas Gladwin. What difference will sustainable development make for MY community?

Randall Campus Center Stewart Community Room

Environmental Issues
2:15PM Saturday, May 4, 1996
Founders Hall 24
F. John Kluth - Presiding

2:15 COMPARATIVE STUDY OF PROCEDURES FOR THE DEPOSITION OF POLYCYCLIC AROMATIC HYDROCARBONS (PAH) ON COAL FLY ASH. **Brian W. May and Robert F. Mauldin, Department of Natural Sciences, Shawnee State University, Portsmouth OH 45662.**

A by-product of burning coal, called fly ash, has been shown to adsorb carcinogenic substances know as polycyclic aromatic hydrocarbons (PAH). It is impossible to calculate extraction efficiencies with native PAH because the initial concentration is unknown; therefore spiked PAH are used to mimic the effects of the natural process. The uniformity of deposition involving spike, slurry-spike, and suspension methods was examined. A surface concentration of 185µg anthracene/g coal fly ash resulted with each deposition procedure. An ultrasonic extraction was performed on the coal fly ash (6.17% C) coated by the suspension method yielding recoveries that were low in uncertainty; whereas it has been shown that a relatively large uncertainty in the recovery of absorbed PAH occurs when using spike and slurry-spike procedures. The high degree of uncertainty indicates that there is a non-uniform surface coating of the PAH in spike and slurry-spike deposition procedures. The suspension method, as

evidenced by greater precision in the extraction results, appears to give rise to a more uniform coating of PAH on the coal fly ash.

2:30 HAZARDOUS CHEMICAL MANAGEMENT IN A MANUFACTURING ENVIRONMENT. **Frederick J. Kluth, National Machine Company, 4880 Hudson Drive, Stow OH 44224-1799.**

Hazardous chemical management in a manufacturing environment involves identifying and locating the hazard. Identifying the hazard involves monitoring the materials coming in through purchases, shipments, and gifts and determining though Material Safety Data Sheets, Labels, and common sense which are liable to present a hazard. Hazards must be gauged in terms of the reactivity, flammability, and health risks of the materials involved. Computer data base techniques are useful for organizing the data involved. This paper describes one approach that has been taken to deal with these issues as well as the nature of the data base that has been required. Particular emphasis is placed on integrating the data collection into the general practice of the business so as to minimize the cost of data collection.

2:45 KINETICS OF OXIDATIVE STABILITY OF UNSATURATED FATTY ACIDS ENCAPSULATED IN CYCLODEXTRINS. **Wendy A. Reichenbach, David B. Min, Department of Food Science & Technology, Ohio State University, 2121 Fyffe Road, Columbus OH 43210.**

The effects of α- and β-cyclodextrin (CD) on the oxidative stability of linoleic (LA) and linolenic (LN) acids stored at 35° C, 50 °C and 65 °C have been studied by measuring headspace O_2 depletion in airtight 35 mL serum bottles. Aqueous solutions of LA or LN were encapsulated in α- or ,β-CD in mole ratios of 1:1, 2:1, 3:1 and 4:1 (moles CD:LA or LN) by homogenization at 8000 rpm for 1 minute and were then dried under vacuum. The headspace O_2 was measured using thermal conductivity gas chromatography. The rates of O_2 depletion at 35°C, 50°C and 65°C for LA alone were .019, .041 and .072, and for LN alone were .022, .063 and .086 mole O_2/L headspace gas, respectively. When LN was encapsulated in CD at a 2:1 (CD:LA) mole ratio, the rates of O_2 depletion were .00049, .21 and .15 for α-CD and were .0031, .095 and .15 for ,β-CD at 35° C, 50° C and 65° C indicating that CD was prooxidative to LN at 50 °C and 65 °C for both α- and ,β-CD. When LA was encapsulated inβ-CD at a 2:1 (CD:LA) mole ratios the rates of O_2 depletion were .0063, .026 and .10 mole O_2/L headspace gas at 35 °C, 50 °C and 65° C, respectively. When LA was encapsulated in α-CD at a 2:1 mole ratio (CD:LA), the rates of O_2 depletion were .00017, .0010 and .011, respectively, indicating that the oxidative stability of LA was increased 110x at 35° C and 410x at 50°C.

3:00 NEANDERTHAL SPEECH AND HUMAN ORIGINS. **Christopher W. Nicolay, Biomedical Sciences, Box 5190, Kent State University, Kent OH 44242.**

Flexion of the inferior surface of the skull has been considered important to the reconstruction of fossil hominid vocal tracts. It has been argued that the European Neanderthals possessed less exocranial flexion than living humans, and consequently were physically limited in their ability to produce speech. Reduced linguistic ability has been suggested as a genetic Isolating mechanism between Neanderthals and "anatomically modern" humans, providing evidence that Neanderthals were an extinct side branch in hominid evolution. Exocranial flexion was examined for samples of human (n=100) and chimpanzee (n=50) skulls from the Cleveland Museum of Natural History. No overlap in the degree of exocranial flexion occurred between the two species. Four skulls with relatively complete bases (including one recently reconstructed skull) comprised the Neanderthal sample. The Neanderthals were encompassed entirely within the range of variation for humans and outside that for chimpanzees. The flexion of the Neanderthal sample (x=41.7°, sd=5.0) was not significantly different than the human sample (x=46.3°, sd=7.5). Consequently, it is unwarranted to use exocranial flexion as an indicator of Neanderthals' ability to produce speech or as evidence that they did not contribute genetically to following European populations.

3:15 THE REPLICABILITY OF THE GRAMEEN BANK APPROACH IN THE UNITED STATES. **Priya A. Satow, C-2660, The College of Wooster, Wooster OH 44691.**

Five features make the Grameen Bank of Bangladesh unique in its approach to women's development: targeting the poor, targeting women, providing microloans, conditionality and group responsibility. This grassroots strategy of making credit accessible to poor woman has been effective in the area of women's development through poverty alleviation and empowerment in Bangladesh, promoting sustainable development through targeting the poorest of the poor. Due to its success, it is important that this strategy can be used elsewhere to combat the feminization of poverty and thereby address a key aspect of sustainable development both in developing and developed countries. In order to test the replicability of this approach in an urban, First World context, two microlending organizations will be examined. The first is the Women's Self-Employment Project (WSEP) in Chicago, which is known to closely mirror the Grameen Bank approach, hence used as model. The second organization will be a smaller one in Ohio, having fewer of the five Grameen features than the WSEP. If both organizations have been successful in empowerment and poverty alleviation, a comparison of the two through interviews of borrowers and organizers will indicate which variables are essential in order to achieve these, and how we can begin to effectively approach women's development in an environment so different from the one in which the Grameen Bank exists. The results will also show which features of the Grameen Bank approach may or may not prove effective in a First World, urban context due to cultural, rural/urban differences.

3:30 HUMAN DEVELOPMENT AND MILITARIZATION: A COMPARISON OF COSTA RICA AND PANAMA, 1970-1985. **Erika Friedman, Box C-1618, The College of Wooster, Wooster OH 44691.**

Identifying priorities consistent with principles of sustainable development may mean reducing the level of militarization. Militarization impedes on a nation's ability to allocate its resources efficiently as well as negatively affecting both present and future human and natural resources. Militarization is especially pronounced in the Third World for which development priorities are so critical. My study proposes to address the following question, "Does a higher level of militarization impede upon the human development of a nation?" By comparing the impact of militarization on development within Costa Rica, a relatively demilitarized nation, and within Panama, a more highly militarized country. The study focuses on the period between 1970-1985.

3:45 CULTURAL INTEGRITY AND PRESERVATION THROUGH SUSTAINABLE DEVELOPMENT. **Liya Aklilu, Box C-1024, The College of Wooster, Wooster OH 44691 .**

The paper examines the effect a sustainable form of development, ecotourism, has on an indigenous population's right to cultural integrity and presentation. Human rights and development have increasingly come to be seen as complementary concerns that reinforce each other. It is generally assumed that an increase in one will eventually lead to an increase in the other. Many development projects disrupt indigenous populations' rights to social well-being and cultural preservation as they do not take their needs or the environment into consideration. Theoretically, sustainable development protects both natural resources and communities from exploitation in the name of development. Ecotourism is promoted as a sustainable form of development and the paper attempts to assess this claim by looking at its impact on both natural resources and communities of indigenous peoples. The cases to be used are two national parks, the Serengeti in Tanzania and the Masai Mara in Kenya. The impact these parks have on the Masai's ability to maintain their culture will be examined.

4:00 ECOFEMINISM AND SUSTAINABLE DEVELOPMENT. **Neela Thapar, Department of Geography, Kent State University, Kent OH 44242.**

Ecofeminism, as a movement started in the 1970's and gained momentum in the 80s. It combines the perspectives of ecology, feminism and peace. The Movement expresses the women's concern as a preserver and nurturer, for environment degradation and environment processes that sustain life. Mies and Shiva view the feminist perspective as one that propounds the need for a new cosmology and new anthropology which recognizes nature including humans, being maintained by cooperation, mutual care and love. This paper looks at the basic ideology of ecofeminism which views the preservation of earth' s diversity and of human cultures as precondition for maintenance of life, the need of such concerns in a capitalistic patriarchal society where man dominates and exploits both nature and women. The paper examines the controversy and protest against construction of a large dam on the Narmada river in India and its implications on the environment and Narmada tribals. The paper also looks at other such examples which reveal ecofeminism viewing 'modernization' and 'development' contributing to destroying and exploiting the nature.

MEDICAL SCIENCES & HEALTH TECHNOLOGIES DIVISION

SCIENCE RELATED TO MEDICINE
9:00AM SATURDAY, MAY 4, 1996
CATTELL LIBRARY 49
JUDY ADAMS - PRESIDING

9:00 THE EFFECT OF SAR-ANGOTENSIN II PERFUSION ON NOREPINEPHRINE RELEASE FROM ISOLATED RAT KIDNEYS. LYNDA EVELETH AND DANIEL ELY, DEPARTMENT OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.

The objective was to determine the perfusion effects of [Sar^1]-Angiotensin II, an analog of Angiotensin II, on norepinephrine (NE) release of isolated kidneys. Male rat kidneys were obtained from the Spontaneously Hypertensive Rat (SHR), *normotensive Wistar-Kyoto* (WKY), *and* SHR/a, *a congenic rat* strain derived from SHR and WKY. Kidneys were surgically removed, isolated, and perfused with one of three concentrations of [Sar^1]-Angiotensin II (10^{-6}M, 10^{-7}M, and 10^{-8}M) for each strain (4 kidneys/ concentration/ strain). Renal nerves were stimulated during five time periods and each consisted of seven minutes nonstimulation and three minutes stimulation. Perfusates were collected and analyzed for NE by HPLC with electrochemical detection and lactate dehydrogenase (LDH). LDH values are used to determine the amount of cellular trauma; kidneys with elevated LDH levels would not be used in the analysis. The NE levels of SHR and WKY kidneys increased with decreasing concentrations of sar-angiotensin II. In the SHR/a strain NE levels remained stable as sar-angiotensin concentration decreased. LDH values for the SHR/ a strain did not show significant differences from LDH values for the SHR and WKY strains. To conclude, the presence of a modified angiotensin II peptide shows an inverse effect with NE release in the kidney, possibly by complementing each other.

9:15 DEVELOPMENT OF A TECHNIQUE TO MEASURE COLLAGEN TYPE I PRODUCTION FROM CULTURED RAT FIBROBLASTS. SUZANNE MORGAN, DARLENE WALRO, AND DANIEL ELY, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.

Recent studies have shown that Angiotensin II (Ang II) and Testosterone (T) cause an increased collagen type I deposition in blood vessels in rats. Studies within our laboratory have shown the Spontaneously Hypertensive Rat (SHR) to have more collagen deposition in vascular walls than the normotensive Wistar-Kyoto (WKY) rat. The objective of this study was to determine if collagen production in cultured SHR fibroblasts is more responsive than WKY fibroblasts to Ang II or T treatments. An assay for collagen type I detection and quantification was developed using an enzyme-linked immunoabsorbant assay (ELISA). Three variables were examined with known amounts of collagen type I: indirect vs. competitive ELISA, blocking solutions (2% BSA or 10% milk) and primary antibody (Rockland Laboratories) concentration. Our findings have shown the indirect ELISA produces the most consistent results. The milk block yielded the lowest background and most reproducible results. Primary antibody concentration was most sensitive to varying collagen type I concentrations at 1:1000 dilution. Presently, fibroblasts are being cultured from both SHR and WKY to determine and compare the effect of Ang II and T on collagen type I synthesis *in vitro*.

9:30 GENETIC EFFECTS OF HEART AND VESSEL COLLAGEN ON HYPERTENSION. R. HAJJAFAR AND D. ELY, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON AKRON OH 44325.

The objective of this study was to examine the genetic and environmental components contributing to collagen deposition in hypertension. Spontaneously Hypertensive Rat (SHR), normotensive Wistar-Kyoto (WKY) and backcross strains SHR/y, and SHR/a were used. A total of 120 rats, five weeks of age, were divided into four groups, i.e. control, castration (5 weeks), castration + testosterone, and hydralazine. At 15 weeks of age the blood pressure (BP) was measured for three consecutive weeks. At this point animals were anesthetized, and heart and mesenteric arteries removed and processed for Electron Microscopy (porolon E5000). Photographs with 600X-1200X sure were video taped, digitized, and the amount of collagen quantified (Sigma Scan). The BP in control group of SHR, SHR/y, and SHR/a were significantly different than the WKY (188+/-5, 178+/-10, 176+/-7, and 123+/-10). There were no significant differences in BP after castration. In the castrated + testosterone group, there were significant differences between SHR, SHR/y, SHR/a compared to WKY (187=/-10, 185+/-10, 184+/-7 to 120+/-10). On hydralazine all strains maintained a BP of 125=/-10. Collagen amount in control group and castrated + testosterone group was significantly higher in SHR, SHR/y and SHR/a than the castrated or hydralazine group. There were no significant collagen differences in WKY in any treatment. These results suggest that the lack of testosterone in castrated animals was a reason for reduced BP and lower amounts or collagen. Preventing the rise of blood pressure with hydralazine kept collagen at a normal level.

10:15 MILK ELECTROLYTE CONTENT OF WISTAR-KYOTO (WKY) AND SPONTANEOUSLY HYPERTENSIVE (SHR) RATS IN THE DEVELOPMENT OF HIGH BLOOD PRESSURE (BP). S.M. BINFORD, R. MCCARTY AND D. ELY, DEPT. OF BIOLOGY, UNIV. OF AKRON, AKRON OH 44325 AND DEPT. OF PSYCHOLOGY, UNIVERSITY OF VIRGINIA, CHARLOTTESVILLE VA 22903.

Cross-fostering experiments between SHR and WKY have shown that exposing SHR pups to milk from WKY mothers can significantly reduce BP of the adult SHR. The purpose of this study was to determine the relationship between milk electrolyte levels in two rat strains to BP of their offspring and to produce a consistent milking technique. Oxytocin (Sigma, 5 i.u. in 0.5ml of H_2O) was injected subcutaneous thirty minutes before milking. WKY and SHR rats were then lightly anaesthetized with Brevital IP and placed in a supine position before samples were collected. A vacuum-assisted milking apparatus was constructed to simulate natural suckling. Vacuum between 25 and 28 cm of mercury, pulsed 25 times/min was used for the duration of milk collection. The samples were frozen at -70°C and analyzed for sodium (Na^+), calcium (Ca^{++}), potassium (K^+), chloride (Cl^-), magnesium (Mg^{++}) and total protein (Hitachi Model 717 clinical analyzer). Milk samples from SHR contained higher concentrations of Na^+ ($p<0.005$) and lower concentrations of Ca^{++}($p<0.01$) and K^+($p<0.03$) compared to WKY. Levels of Mg^{++}, Cl^- and protein were not significantly different. These findings are consistent with those reported by McCarty and Tong 1992. The dietary content of electrolytes that have been implicated in the development of hypertension differs between SHR and WKY strains.

10:30 DEVELOPMENT OF A LUNGE STANDARDIZATION TEST FOR THE USE IN LOWER EXTREMITY INJURIES. KRISTIE O. ADLOFF, SIMON K. LAWRANCE, AND TIMOTHY BERRIDGE, DEPT. OF LIFE AND EARTH SCIENCES, OTTERBEIN COLLEGE, WESTERVILLE OH 43081.

Preliminary research in Physical Therapy has shown that closed kinetic chain exercises are more beneficial than open kinetic chain exercises during rehabilitation. Closed kinetic chain activities require the entire lower extremity muscles to work together, while open kinetic chain activities isolate a specific muscle. A closed kinetic chain exercise used in the therapy of patients with lower extremity injuries is the lunge. Research has concentrated on the assessment of a patient performing the open kinetic chain exercises. However, limited research is available regarding closed kinetic chain activities which are utilized to evaluate the patient's improvement. Therefore, the purpose of this study is to develop a standardization of the lunge test which will monitor the patient's progress during rehabilitation. This standardization will be determined by correlating the measurements of healthy subjects' leg length to the subjects anterior and lateral lunge. The standardization of the lunge test will allow therapists to evaluate a patient's progress with lower extremity injuries.

10:45 SCIENCE FOR NURSES: SUCCESSFUL TEACHING STRATEGIES. MARY D GAHBAUER, LIFE SCIENCE DEPT., OTTERBEIN COLLEGE, MAIN STREET, WESTERVILLE OH 43081.

There have been numerous publications over the last ten years on the need for nursing education to keep pace with the increase in knowledge of the biological sciences, but this has not occurred. Furthermore, nurses have been described as being 'relatively uninterested' in natural science. Fears are expressed that there will be a widening gap between nursing theory and the reality of biological disturbance in patients. The author, who has experience of clinical practice as well as the teaching of science to nurses at all stages of training, examines teaching strategies which have proven successful in gaining nursing student interest and engagement in learning life science.

3:00 POSTER BREAK

SCIENCE RELATED TO MEDICINE
4:00PM SATURDAY, MAY 4, 1996
CATTELL LIBRARY 49
MARY D. GAHBAUER - PRESIDING

4:00 PKC MAY BE REQUIRED FOR EARLY EVENTS IN HSV-1 REPLICATION. SONIA M. WALIA AND DARLENE G. WALRO, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH. 44325-3908.

Previously we have shown that levels of cellular protein kinase C (PKC) increase during the first 1 h following infection with herpes simplex virus type 1 (HSV-1) and then decrease to background levels throughout the remainder of the infection cycle. We have further shown that H-7, an inhibitor of PKC, inhibits HSV-I production. Here we examined the kinetics of virus protein synthesis by immunofluoresence (IF) and DNA production by Southern hybridization. Virus proteins representative of the early and late classes were detected by IF at 6 and 9 h post-infection, respectively, in untreated infected cells but were barely detectable by 12 h post infection in H-7 treated cells. Similarly, the onset of DNA synthesis occurred later in H-7 treated infected cells than in untreated infected cells. Maximum anti-viral activity was demonstrated when H-7 was added during the first 4 h of infection and H-7 was less inhibitory when added after 6 h post-infection. These data suggest that phosphorylation of either cellular or viral proteins by PKC are important in the initial steps of HSV-I infection. We are presently comparing the phosphorylation states of HSV-I immediate early proteins in untreated and H-7 treated cells in order to identify the target of the antiviral activity of H-7.

4:15 W-7, AN INHIBITOR OF CALMODULIN-DEPENDENT PROTEIN KINASES, INHIBITS A LATE SLEEP IN HSV-L REPLICATION. DARLENE G. WALRO, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.

It has been shown that N-(6-aminohexyl) 5-chloro-1-napthalene-sulfonamide (code name = W-7) inhibited herpes simplex virus type 1 (HSV-1) in a dose-dependent manner at concentrations which were not toxic to uninfected cells. Early viral protein synthesis was similar between untreated and W-7-treated virus-infected cells as measured by immunofluoresence and Western immunoblotting. Electron microscopy analysis of nuclei revealed that capsids were aberrantly shaped and the ratio of immature to mature capsids was higher in drug-treated cells compared to untreated cells. SDS-PAGE analysis demonstrated that several polypeptides were under represented in capsids isolated from nuclei of drug treated cells compared to capsids isolated from untreated cells. Several capsid proteins isolated from nuclei of untreated cells were phosphorylated *in vivo* but were not phosphorylated in W-7-treated cells. These data suggest that W-7 may affect synthesis and/or phosphorylation of capsid proteins thereby reducing HSV-I production.

4:30 NATURAL SUPPRESSOR (NS) CELL SUPPRESSION OF A TH1 RESPONSE ACROSS A CELL-IMPERMEABLE MEMBRANE. STEVE KISH, AMY MILSTED, JAMES H. HOLDA. THE UNIVERSITY OF AKRON, DEPT. OF BIOLOGY, AKRON OH 44325-3908.

NS cells are large granular lymphocytes found in areas of high hematopoietic activity. NS cells suppress immune responses in a genetically unrestricted, nonspecific manner. Our results suggest that NS cells preferentially suppress the development of Th1 cells. To further verify that NS cells suppress Th1 cell development, we developed a suppression assay across a cell-impermeable membrane. Inserts containing a cell-impermeable membrane were placed into the wells of a 24 well plate. 4 x 10^6 bone marrow (BM) cells from C57B1/6 mice (a source of NS cells) were placed inside the insert. 10^6 spleen cells (SpC) plus a stimulating agent, either the mitogen Con A or anti-CD3 antibody, were added to the well outside the insert. The assays were run for 72 and 48 hours, respectively. Suppression was determined through ^{3}H-thymidine uptake. Results show that NS cells suppressed both Con A induced proliferation (66.5%) and anti-CD3 induced proliferation (52.0%) across a cell-impermeable membrane. However, the kinetics are different. To suppress a Con A response, SpC and BM cells can be added to the wells simultaneously. To suppress an anti-CD3 response, BM cells must be incubated in the inserts 24 hours before the addition of SpC and antibody. To confirm preferential NS cell suppression of Th1 cells, SpC were stimulated with anti-CD3 antibody in the presence of BM (as described above). RNA was isolated after 1.5, 4 and 24 hours. A Northern blot analysis for IFN-gamma (Th1 cell) and IL-4 and IL-5 (Th2 cell) was performed. Preliminary mRNA results show that NS cells can suppress the Th1 lymphokine IFN-gamma, as compared to unsuppressed controls, across a cell-impermeable membrane.

4:45 THE ROLE OF FLUORESCENT *IN SITU* HYBRIDIZATION (FISH) FOR HELPING TO DEFINE A MALIGNANCY. JEFF B. VANDEUSEN,, DAVID L. MASON, MIGUEL A. PEDRAZA, AND ELIZABETH E. POWELSON, WITTENBERG UNIVERSITY AND COMMUNITY HOSPITAL, SPRINGFIELD OH 45501.

Within the last five years, a new technique has been developed for locating DNA sequences in interphase nuclei by the application of DNA probes. This technique, adapted for the identification of aberrant genes associated with certain cancers, may be used for the prediction of progression of the malignancy. This study probed for the HER-2/neu (ErbB-2) oncogene because it has been found to be associated with prognosis in breast cancer. Several other cancers available to probe detection are discussed.

SOCIAL & BEHAVIORAL SCIENCES DIVISION

HEALTH BEHAVIORS AND QUALITY OF LIFE - THE COLLEGE POPULATION: ISSUES AND IMPLICATIONS
9:00AM SATURDAY, MAY 4, 1996
CATTELL LIBRARY 46
ALINDE MOORE - PRESIDING

9:00 HEALTH BEHAVIORS IN PEOPLE AND PETS: A REPLICATION AND EXTENSION. JENNIFER TURNES, BERNADETTE GALLOWAY, JACQUELINE RITZIUS, AND SARA STAATS. THE OHIO STATE UNIVERSITY AT NEWARK, 2044 FOUNDER'S HALL, 1179 UNIVERSITY DRIVE, NEWARK OH 43055.

A majority of Americans own pets and spend time and financial resources on their pets. A literature review yielded mixed results. However, there is evidence that improved human health may be one benefit of the human animal bond. Previously, we have demonstrated that there is a significant correlation between engaging in self and pet health maintaining behaviors. This suggests that a direct behavioral mechanism may be one cause of links between human and pet health. Here, we replicate that finding with a new data set ($r_{N=214}$)=.24, $p < .001$) and explore additional relationships with additional variables such as quality of life measures, resource allocation, commitment, and expected contribution of a pet to one's quality of life. A multiple regression equation modeled the best life one could expect to have now against measures relating to pet ownership such as pet attachment and commitment. Results indicated that commitment to pets made a significant contribution to estimates of the person's positive expectations of their life.

9:15 IMPACT OF CANCER: COPING PROCESS AND QUALITY OF LIFE. KERRY S. KENNEDY, MUC#558, 1972 CLARK ST., ALLIANCE OH 44601.

This paper examines how the diagnosis of cancer affects the patient's self-esteem, coping process, and quality of life. Newly diagnosed patients, those who have had treatment, and those in remission are included in this sample (n=75). Questionnaires were distributed through an Oncologist's office. The following hypothesis were tested: the quality of life after the diagnosis of cancer will be lower than the quality of life prior to diagnosis, the higher the perceived social support the higher the quality of life, and the higher the self-esteem, the higher the quality of life. The coping process was examined in perceived social support. Locus of control was used to determine if the patient is active or passive. A patient assuming the active role, defined as going above and beyond what the physician recommends by going to support groups or information seeking, was found to have control over the outcome of the illness, in contrast to the passive patient who blamed outside or chance happenings for his/her illness.

9:45 ENVIRONMENTAL ASSESSMENT: PSYCHOLOGICAL/ ENVIRONMENTAL FACTORS-SUBSTANCE ABUSE ON CAMPUS. **Robert A. Dubick, University of Akron, 301-F Zook Hall, Akron OH 44325-4208.**

Over the past six years data on over 25,000 college students from 42 colleges nationwide have been collected and analyzed. This effort calls for a fundamental reorientation in dealing with the drug and alcohol problem as an educational task and objective. This study uses procactive prevention which is built on a distinction between a medically focused treatment approach and a pysco-environmentally focused prevention approach. This analysis has resulted in findings pertaining to dominant psychological predisposition's and propensities, and social environmental influences upon resistance/ vulnerability levels. The practical value of the new information in these areas is tremendous for systematic approaches to proactive prevention programming activities on campuses. The presenter is currently involved in an analysis grant developing training based on the new knowledge. The principle focus of the analysis is upon training and applications with specific reference to the incorporation of research findings into university training, education, and activities programs.

10:00 TRADITIONAL VERSUS ADULT STUDIES STUDENTS: THE COLLEGE EXPERIENCE. **Bernadetta J. King, Campus Box 1443 Mount Union College, 1972 Clark Ave., Alliance OH 44601.**

There are distinct differences between adult studies students, those returning to college after a number of years, and traditional students, those who enter college immediately after high school. According to the literature, adult students report less social support available for them within the college setting than for traditional students, but adult students use more social support form outside the college community than do traditional students. Adults experience more demands besides college and more concerns with everyday conditions, yet adult students perform better academically, have more confidence in their academic ability, and experience less stress on a regular basis than traditional students. In addition, the younger a student is the more likely he/she is to be attending college for vocational reasons, and the older a student is the more likely he/she is to be attending college for reasons of personal enrichment. I found the same relationship among traditional and adult studies students at Mount Union College as appeared in the literature. I am using secondary analysis of data gathered from a survey conducted at Mount Union College in the spring semester of 1994 to study this topic.

10:15 FACETS OF AGGRESSIVE BEHAVIOR. **Bernadette Galloway, Jeffrey Stagg, Jennifer Turnes, and Sara Staats, The Ohio State University at Newark, 1179 University Dr., Newark OH 43055.**

Aggressive or agonistic behavior may be viewed from several perspectives including the goal of the behavior, the situational context, the target, the instigator, and moderating influences on aggressive behavior such as empathy. The present study addresses the above in a sample of 176 college students, of whom 115 were women. Consistent with a majority of the literature, we found that women are more empathic than men and that their goals tend to be expressive rather than instrumental. Empathy was significantly correlated with an expressive goal ($r = .27^{**}$) but was unrelated to situational reactions. With regard to situations we found that age group was a more significant predictor of aggressive response than gender and we describe two distinct patterns of age/gender responses. In social situations, we find young men most aggressive and older women least aggressive. In physical situations (someone pushes you) and in property damage situations, we found interaction effects with older men most aggressive and younger men least aggressive. Various aspects of aggression are discussed in an age/cohort perspective and the results of two independent samples will be discussed.

10:30 DIVERSITY IN THE FUTURE WORK FORCE. **Riley Crandell, Jennifer Turnes, and Sara Staats, The Ohio state University at Newark, 2044 Founder's Hall, 1179 University Drive, Newark OH 43055.**

Increasing diversity is expected in the future work force. The Bureaus of the Census (1993) projects increasing diversity in several areas including age, gender, ethnic/racial diversity, and in the inclusion of persons with disabilities. Because current college students will spend much of their lives in the work force of the future, we are surveying them concerning their expectations about diversity. Our current results show that students would find interactions with diverse co-workers significantly easier than interactions with either diverse supervisors or diverse employees. This finding is of importance because employers often cite difficulty of integrating persons of disability or difference into a work group as a reason for not hiring such persons. Fuqua, Rathbun, and Gade (1984) reported the most frequent reasons for employers not hiring persons with disabilities were perceived lower productivity, higher accident, and higher worker's compensation rates. Many investigators have concluded that employers view persons with disabilities seeking employment negatively (Fuqua, Rathbun, & Gade, 1994; Johnson and Heal, 1976; Scheuerle, Guilford, & Garcia, 1982). Since the college student of today could/will be the employer of tomorrow their opinions and attitudes of diversity is of major importance.

10:45 GENDER REPRESENTATION ON LOCAL TELEVISION NEWSCASTS. **Derek E. Hatcher, Mount Union College, Alliance OH 44601.**

The media has been under scrutiny for its portrayal of gender and its promotion of gender stratification. Broadcast news reaches millions of viewers and may have an affect on public opinion. This project examines the representation of gender on four local Cleveland television stations. Through the use of content analysis, gender representation was studied with respect to male and female on-air times, the location from where a story is reported, who is interviewed on camera during the course of the story, and with respect to the subject of the story. The literature indicated that men where represented significantly more than women in the categories under study. Following the results reported in the review of the literature, the hypotheses tested suppose that men would be over represented on television newscasts when compared to women. Men where found to be dominant in these news programs, and certain story subjects where found to be gender-specific. Also, some stations had greater variations than others. The randomly selected sample (n=80) was observed on week nights only. Included in this study was a theoretical background in Conflict Theory to sociologically explain gender stratification and male dominance.

Social Process: An Interdisciplinary Approach to Methodology
2:15PM Saturday, May 4, 1996
Cattell Library 46
Robert M. Cikraji - Presiding

2:15 IDENTIFICATION OF DYNAMIC SYSTEMS: A GUIDE FOR THE NEW RESEARCHER. **Taan S. El-Ali, Wilberforce University, Division of Engineering and Computer Science, Wilberforce OH 45384.**

The subject of system identification covers many areas in engineering and science. One can find system identification techniques applied in civil engineering, electrical engineering, mechanical engineering, physics, and many other fields. Within each field the process of identification takes different approaches. Some approaches deal with real-time identification while others deal with frequency domain identification. Within each approach different techniques are used and systems with single-input single-output and multi-input multi-output are visited. This paper will make it easy for the new researcher in the field of system identification. It will discuss the meaning of identification of dynamic systems and will take the researcher from basic identification techniques to the most recent ones. It will not cover all techniques available, but will help the new researcher to build a strong understanding of the concept of identification and opens the way for advanced research.

2:30 MODELS OF SUSTAINING HUMAN AND NATURAL DEVELOPMENT IN AN URBAN ENVIRONMENT. **Timothy J. Peterson, Malone College. 515 25th St. NW. Canton OH 44709.**

This paper considers the role of natural and social factors in human settlement patterns to issues of sustainability and change. As an increasing portion of people live in or near metropolitan areas, important questions related to the quality of life need to be addressed; of special concern are the people and places in our inner cities. Issues of sustainability, reproducibility, and equity are used to assess the effectiveness of organizational and technological models which connect the human, biotic, and abiotic components of an urban environment. Suggestions are offered on the basis of natural resource restoration, reintegration, and renewal; minimum level of resource utilization and nonrenewable consumption, matched by development of new resources and alterna-

tive technology, and a balance between emissions into the air, soil, and water compatible with capability of absorption, neutralization, and recycling of by-products from resource consumption.

2:45 A SOCIAL PROCESS ANALYSIS OF THE COURSE OF ILLNESS OF HUMAN IIMMUNODEFICIENCY VIRUS, ACQUIRED IMMUNE DEFICIENCY SYNDROME, AND AIDS RELATED COMPLEX POPULATIONS AND THE AMERICANS WITH DISABILITIES ACT. Robert M. Cikraji, 15 Miller Hall, Ashland University, Ashland OH 44805.

The applicability of The Americans with Disability Act to Human Immunodeficiency Virus, Acquired Immune Deficiency Syndrome, and AIDS Related Complex populations has been established by the Equal Employment Opportunity Commission and court decisions. The disease progression, with its distinct stages, presents special and unique legal issues for both these disabled employees and their employers. This social process analysis addresses legally identifiable concerns.

3:00 THE AMERICANS WITH DISABILITY ACT AND ITS APPLICABILITY TO THE MENTALLY ILL, HUMAN IMMUNODEFICIENCY VIRUS AND ACQUIRED IMMUNE DEFICIENCY SYNDROME POPULATIONS: A STATISTICAL ANALYSIS. Robert M. Cikraji, 15 Miller Hall, Ashland University, Ashland OH 44805.

The Americans with Disabilities Act, enacted into law in 1990, became effective July 26, 1992. The law prohibits employers, state and local governments, employment agencies and labor unions from discriminating against qualified individuals with physical or mental disabilities in the application for employment, hiring, discharging, advancement, compensation, job training and other terms and conditions of employment. An analysis of filings with the Equal Employment Opportunity Commission and federal court cases evidence a parallel between individuals with a disability of major mental illness and those with diagnoses of Human Immunodeficiency Virus, AIDS Related Complex and Acquired immune Deficiency Syndrome. Both populations are disproportionately represented within the regulatory and legal system. These cases and new federal interpretations and legal definitions require additional examination of the term "accommodation" pursuant to The Americans with Disabilities Act.

3:30 Division Meeting

JUNIOR ACADEMY
2:00PM SATURDAY, MAY 4, 1996
CATTELL LIBRARY 49
KENNETH R. MERRICK - PRESIDING

2:00 ELECTROPHORESIS OF COMPLEX ORGANIC DYES. Andrew J. Sauer, 5185 Red Bird Lane, Indian Springs OH 45011.

This project tested the electrophoretic mobility of Bromophenol blue, Methylene blue, and Xylene cyanol FF at varying buffer concentrations. A 1.1 percent agarose gel, and a tris/borate/EDTA buffer at 0.25, 0.5, 0.75, 1.0, 1.25, 1.5 and 1.75 x concentrations were used. Each buffer concentration was used in three tests, and each test included two wells of each dye. The dyes moved farther at higher concentrations, as expected, but it was also found that the difference in the distance that the dyes moved between tests was lower at higher concentrations. A hypothesis was made that at a higher concentration, there were enough ions in the buffer to counter the effect of the fluctuation of the electrical charges of the dyes. For this hypothesis to hold true, the dyes would have to be separated by molecular size, meaning that Methylene blue would move farthest, Xylene cyanol FF an intermediate distance, and Bromophenol blue the smallest distance. A problem arose with this hypothesis; Bromophenol blue moved the intermediate distance, and Xylene cyanol FF moved the smallest distance after further research, it was found that borate reacts with glycol compounds, giving a possible explanation to the problem. This year, a tris/glycine buffer is being used and the experiment is being repeated to test the hypothesis. This year's results are nearly the same as last year's, disproving the hypothesis.

2:15 POSSIBLE ORIGINS OF THE DARK BANDS ON THE SIDESCAN SONAR RECORDS FROM LAKE ERIE'S CENTRAL BASIN. J. Autumn Spehar, 3709 Scottley Drive. Sandusky OH 44870.

The distribution of the dark bands on sidescan radar from records from the central basin of Lake Erie was investigated to assist in understanding the origin of the bands. Records representing about 500 nautical miles of track line from Ohio's portion of the basin were analyzed and the following classifications were made: band width, length orientation and depth of occurrence. Natural gas seepage along joint patterns is one of the source suggestions. Orientation data suggests that there are two preferential alignments (71° and 106°). These do not align well with the regional joint patterns in the Ohio shale (130°) which is the bedrock in most of the region, nor with the 60° or 85° of the Columbus joint patterns. Joint orientation in the tills have not been documented well enough to eliminate them as a source. Distribution data suggest that the bands are not preferentially associated with shipping channels. The 71° azimuth almost parallels the major axis of the lake and also the prevailing SW wind direction. This correlation suggests that the orientation may be best associated with iceberg scour of the bottom. Cross correlation of depth and occurrence suggest that the majority of the bands occur in water depths between 10m and 22m. The sidescan sonar records are part of the Ohio Geological Survey and US Geological Survey cooperative study of the coastal area of the Ohio Portion of Lake Erie.

2:30 GENETIC CODE IDENTIFICATION: EXPLORING ERROR RECOGNITION WITH SIGHT, SOUND, AND TOUCH. Chamie R. Townsend, PO Box 18431, Cleveland Heights OH 44118.

Research in DNA sequencing requires high levels of speed and accuracy along with relatively low levels of stress and fatigue. This project explored whether adding different multi-sensory techniques, such as sight, sound, and touch, to the reading of DNA sequences would have a positive affect on the four areas mentioned above when compared to the regular method of using only textual data. Genetic text, taken from Robert Shapiro's *The Human Blueprint,* was transcribed into stickers for the sight tests by assigning each DNA base a specific sticker. Participants were tested to see which sticker format made it easier to find errors. Amino acid sequences were used m the sound tests where the texts for normal blood and sickled-cell anemia blood were transcribed into musical tones. Participants attempted to identify tone errors as they compared the two groups, the control group and a group randomly generated by the computer. The touch method resembled the sight method with beads replacing stickers. Data collected from exploring the different methods were recorded and analyzed by age and gender within the four areas. Overall results supported the hypothesis. Specific results showed that response levels were greatly affected by the participants' personal experiences and specific preferences. This pointed to the unexpected conclusion that sequence reading should support the ability to personalize conditions associated with the reading environment. Other multi-sensory approaches are under study.

2:45 BIOREMEDIATION: BIOSTIMULATION VERSUS BIOAUGMENTATION. Adrienne L. Menniti, Rt. 6 Box 526G, Proctorville OH 45669.

The goal of this project was to evaluate the use of biostimulation and bioaugmentation in remediating petroleum hydrocarbon contaminated soil using a bioreactor. Four bioreactors were filled with contaminated soil and groundwater and the bioslurry was mixed and aerated continuously for 39 days. The first bioreactor was the control and only mixed during the experiment. Bioreactor number two was mixed and aerated. Bioreactor number three contained a mixture of soil with nutrients in the form of fertilizer and manure. Bioreactor number four contained a mixture of soil with nutrients and cultured petroleum hydrocarbon reducing microorganisms. All the bioreactors showed a reduction in the contaminant levels with bioreactor #4 having the most notable reduction. The hydrocarbon concentration level of the soil in bioreactor #4 was reduced by 52.5%. Bioreactor #3 experienced a 30.5% reduction while bioreactor #2 showed a reduction of 33.3%. Bioreactor #1 experienced a reduction of 23.5%. The results showed that, when used in a bioreactor, bioaugmentation produces a greater petroleum hydrocarbon reduction because the microorganisms introduced into the soil are enumerated. These enumerated microorganisms remediated the petroleum hydrocarbon contamination very effectively. There is also a small amount of reduction that can be attributed to volatilization due to the aeration of the bioreactors.

3:00 HOW TO PICK THE SMART CHICK. Meagan A. Carpenter, 60941 Warner Dr., Barnsville OH 43713-9662.

When you order baby chickens, some hatcheries will charge higher prices for certain varieties inside of a particular breed. The hatchery claims that these chicks are more intelligent than the cheaper chicks. This sparked my

curiosity The purpose of my project was to test the learning abilities of seven different varieties of chickens under two different breed categories of different price ranges. An additional question was if the sex of the animal made an impact or not. I decided to teach them tricks. After working for twenty minutes a day for 119 days, each one of the fourteen chicks could sit inside of a hoop, ride in a carriage, perch on my shoulder, and take a bath. I found that each chicken required a different number of tries for each trick before it understood the concept. The averaged data proved that the hatchery was using a form of propaganda. Regardless of the variety or sex, they all learned relatively (within two tries) equally.

3:15 COMPARATIVE TESTING OF ALTERNATIVE THERMAL INSULATIONS. **Matthew E. Mowrer, 67610 Airport Rd., St. Clairsville OH 43950.**

The purpose of my research was to determine if there was a viable alternative thermal insulation to be used in small applications. To determine this I constructed three double-walled testing chambers. Each chamber consists of a six-inch cube in which is suspended a four-inch cube equally spaced from all walls. In the four-inch cube is a light bulb acting as a heat source. The cavity formed by the walls of the two cubes is then filled with the insulating material to be tested. As the heat source warms the air in the four-inch cube to a consistent thermostat-controlled temperature of 32.3 Degrees Celsius (90 Degrees Fahrenheit), the thermal energy flows toward the outer wall of the chamber. The insulating material restricts this movement. The less restrictive the insulating material, the more time the heat source is on, maintaining the set temperature, and using energy, which is measured in Watt-hours. The efficiency of each material is then calculated by comparing the energy consumed by the control chamber in a set amount of time to the energy consumed by the individual testing chamber in that same amount of time. After several test sequences, I came to the conclusion that the tile-type insulation (a substitute for foam insulation sheeting and most commonly appearing as plaster on walls and ceilings), was substantially more thermal efficient than the llama wool (a substitute for glass fiber-type insulations).

3:30 MANURE: FRIEND OR FOE? NON-POINT SOURCE POLLUTION. **Kenneth R. Merrick, 25872 Sandy Springs Rd., Minerva OH 44657.**

Farms are often seen as a source of non-point pollution. This study examined the impact of dairy farming on water quality in Conser Run and Sandy Creek, third and fourth order streams, respectively. Water quality was determined on the basis of BOD (Biological Oxygen Demand), nitrate, ammonia, and phosphate concentration. The samples were taken at eight bridges along each of the streams. Between sites two and four on Conser Run there are five farms and a total of 680 cows. One site two miles upstream from the farms provided reference levels for nutrients and BOD before the water passed the farms. Nitrate, ammonia, and phosphate concentrations were determined spectrophotometrically using a Tecator flow injection analyzer. Oxygen concentrations were determined using a Clark polarographic electrode. The results showed that on the average, ammonia concentrations were near detection limits in the farm area but increased downstream. Average nitrate concentrations stayed the same throughout all the sample sites. Phosphate levels were at the limit of detection at all the test sites. Average BOD levels (72 hr at 20 C) were initially at one part per million and rose to two parts per million in the farm area and then rose to three parts per million farther downstream. All levels for nutrients and BOD were well below safe levels. However, the test results show an average increase in nutrients and BOD levels as the water moved farther down stream, thus showing that something other than the farms are polluting the streams.

3:45 SEWAGE SLUDGE COMPOST BATTERY. **Ross C. Larue, 9661 Goodman Rd., Groveport OH 43125.**

My project involved research to develop a biological battery using Sewage Sludge Compost as the primary ingredient. The compost came from the City of Columbus (aerated static pile procedure) and the City of Akron (enclosed vessel procedure). The two resulting products are indistinguishable in composition and appearance. In my battery, I discovered that there are aerobic and anaerobic bacterial activity; heavy metals present such as lead, cadmium, and zinc, and organic acids from the bacteria. I made an open wet cell by adding 5% NH4Cl and a sealed dry cell by replacing commercial battery ingredients with Sewage Sludge Compost in various proportions. The electrodes used were a carbon rod (the cathode where reduction occurs) and zinc (the anode where oxidation occurs) The difference in potential between the electrodes was 1.5 volts. I have applied for a US patent, and a patent is pending.

4:00 Poster Break

Interdisciplinary Team Research
3:15PM Saturday, May 4, 1996
Osborn Hall 21
Richard Storck - Presiding

PRESENTING SIX WINNING TEAM PROJECTS

The Ohio Academy of Science Senior Academy Council has selected six projects, based on the abstracts submitted, as the best representatives we have this year of interdisciplinary team process and content. These are our winning projects. In this session, each team will highlight the interdisciplinary approaches they found useful. They will also identify the interdisciplinary issues and problems that they encountered. Please note that the research findings will not be emphasized in this session since they will have been presented in earlier sessions. The purposes of this session are:

1. To provide an opportunity for each project to review their research objective and procedures from the perspectives/methodologies of the various disciplines involved with the project.
2. To enable selected discussants to highlight the advantages and disadvantages associated with interdisciplinary team research in the sciences.
3. To enable the audience to offer their own expereinces and to formulate ideas and strategies to help the Academy foster interdisciplinary research in Ohio.

Chair: Mr. Richard Storck, Wooster High School
Discussants: Selected team representatives
Recorder: Dr. Ayres D'Costa, The Ohio State University

Session Schedule:

A. Brief presentations by Winning Project Leaders

3:10 PROTECTING WATER QUALITY THROUGH THE SUCCESSFUL INTEGRATION OF RESEARCH AND EDUCATION. **N.L. Watermeier and L.C. Brown.,Agricultural Engineering Department. The Ohio State University, Columbus OH 43210-1057.** **See page 32 for abstract.**

3:20 SOURCES OF PERSISTENT AND BIOACCUMULATIVE POLLUTANTS DISCHARGED TO LAKE ERIE FROM OHIO POINT SOURCES. J.R. Beaver[1], L. Yeomans[2], and B.A. Schaberg[3], [1]University of Akron, Department of Biology, ASC, Akron OH 44325, [2]Citizens Policy Center/Ohio Citizen Action, 402 Terminal Tower, Cleveland OH 44113, [3]Beaver Schaberg Associates, Inc., 3620 Ingleside Road, Shaker Heights OH. See page 33 for abstract.

3:30 IMPACTS OF EROSION ON THE BENTHIC MACROINVERTEBRATE COMMUNITY OF THE EAST BRANCH OF NIMISHILLEN CREEK DURING WINTER. T.R. Paulus[1] and J.R. Beaver[2], [1]Stark County Health Department, 3951 Convenience Circle NW, Canton OH, 44718, [2]University of Akron, Department of Biology, ASC, Akron OH 44325. See page 13 for abstract.

3:40 GEOMETRY OF STABLE CAPTURE ZONES FOR PLANET EARTH: POTENTIAL FOR CALCULATION OF THE PROBABILITIES OF GRAVITATIONAL CAPTURE OF SATELLITES. Robert J. Malcuit, Dept. of Geology and Geography, Ronald R. Winters, Dept. of Physics and Astronomy, Denison Univ., Granville OH 43023. See page 30 for abstract.

3:50 COMPARISON AND DIGITAL ANALYSIS OF VOCALIZATION PATTERNS AND REPERTOIRES OF MALE RED-WINGED BLACKBIRDS (*AGELAIUS PHOENICEUS*). S. Mukina[A], D. Bebell[A], J. Antonelli[B], C. Skinner[B], and G. McLaren[A], [A]Department of Psychology and [B]Department of Biology, Edinboro University of Pennsylvania, Edinboro PA 16444. See page 14 for abstract.

4:00 NEW MAP OF OHIO ECOREGIONS DELINEATES 19 AREAS LARGER THAN 1000 SQ.KM. C. Scott Brockman, Ohio Geological Survey, 4383 Fountain Square Dr., Columbus OH 43224. See page 10 for abstract.

4:15 - 5:00
B. Discussion of Interdisciplinary Issues

5:00 - 5:30
C. Summary formulation of ideas and strategies by audience.

Preliminary
Call for Papers

Don't miss the 106th Annual Meeting of
The Ohio Academy of Science to be hosted by

Bowling Green State University
April 4-5-6, 1997

Abstract deadline: Postmarked by
November 15, 1996

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